



IOC Sub-Commission for the Western Pacific

Tenth Session

Phuket, Thailand
12–15 May 2015

Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

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1. OPENING

- 1 The 10th Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-X) was convened at 09:00 a.m. on Tuesday, 12 May 2015 at the Cape Panwa Hotel, Phuket, Thailand. The Session was organized by the IOC Regional Office for the Western Pacific (WESTPAC Office), and hosted by the Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment, Thailand with participation of close to 100 delegates and representatives from 15 Member States in the region and partners from the United Nations Environment Programme/Northwest Pacific Action Plan (UNEP/NOWPAP), the Food and Agriculture Organization/Bay of Bengal Large Marine Ecosystem Project (FAO/BOBLME), Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), World Climate Research Program/Climate Variability and Predictability (WCRP/CLIVAR), and the IOC Sub-Commission for Africa and Adjacent Island States (IOCAFRICA).
- 2 At the opening ceremony, Dr Punlop Singhasene, Vice-Governor of the Phuket Province, welcomed all delegates and representatives to this beautiful place. Recognized as one of the world's most popular tourism destinations, the coasts and ocean in Phuket have been affected by the ever-increasing number of tourists. He thanked the Department of Marine and Coastal Resources and WESTPAC for selecting Phuket as the meeting venue, and expressed his expectation the scientific input would be of help to address these marine environmental issues.
- 3 On behalf of the host government, Mr Vudichai Janekarn, Deputy Director General of the Department of Marine and Coastal Resources (DMCR), delivered his opening remarks by expressing his gratitude to WESTPAC for giving this opportunity to Thailand to host this very important event. Recognizing the importance of marine science to the wellbeing of humanity, Thailand has been engaged in various UNESCO/IOC programmes both at a global and regional level. Furthermore, Thailand has been hosting the WESTPAC Office with administrative support having provided since 1994. He further reiterated the willingness of the Government of Thailand to support WESTPAC. He also briefed the Session that Thailand has been taking an active part in a wide range of WESTPAC programmes and activities, including SEAGOOS and its pilot projects, marine biodiversity-related programmes and capacity development. To address the pressing challenges posed by climate change, he stressed the need for intensified efforts in education, research, and development of appropriate models to improve knowledge and mitigate its impacts. He finally called on all countries to cooperate closely to address trans-boundary issues for the protection and conservation of natural resources and sustainable management.
- 4 Dr Vladimir Ryabinin, IOC Executive Secretary and Assistant Director-General of UNESCO, speaking on behalf of the Commission and Director-General of UNESCO, congratulated WESTPAC on the great achievements made in the past. He recalled his early engagement in IOC and WESTPAC's NEAR-GOOS programme, and confirmed his commitment to working in WESTPAC in his new role. He expressed his gratitude to WESTPAC for its excellent work done during difficult times, and highlighted the strengths of WESTPAC on its science development and capacity building. Given the environmental, and socio-economic importance of the ocean to the WESTPAC region, he stressed the importance to develop marine science among Member States. While highly valuing the enthusiastic spirit and the commitment of WESTPAC Member States to marine science development, he finally expressed his deepest thanks to the Kingdom of Thailand for the generous support provided to the WESTPAC office in Bangkok and the whole of WESTPAC for offering such a wonderful venue for this Session.
- 5 Dr Somkiat Khokiattiwong, Chairperson of WESTPAC, welcomed all participants and thanked the Government of Thailand for hosting the Session. He congratulated Dr Ryabinin on his new appointment as the Executive Secretary of IOC, and informed the meeting that Sri-

Lanka has officially been accepted as the 21st Member State of WESTPAC. Recalling the 25th Anniversary of WESTPAC, he expressed his appreciation to all Member States for their contribution to the development and implementation of a series of commemorative activities. In particular, he highlighted the great success of the 9th WESTPAC International Scientific Symposium. The overwhelming number of participants and presentations demonstrated the great achievement of WESTPAC in marine science cooperation over the past years. He expressed his pride in serving as the Chair of the most outstanding regional subsidiary body of IOC. He owed the success of WESTPAC to the strong ownership of its Member States and the high-quality performance of the WESTPAC Office. To address many emerging challenges related to climate change, he highlighted the importance of capacity building as an effective tool to advance knowledge. He commended the great importance WESTPAC has been attaching to capacity building, as demonstrated through its adaptive and self-driven approaches, such as the initiative of "IOC Regional Network of Training and Research Centers on Marine Science". He concluded his opening remarks by expressing his thanks to all Member States for their support provided to him over the past three years.

6 The complete statements made at the opening ceremony are provided as [Annex III](#).

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF THE AGENDA

7 Dr Somkiat Khokiattiwong, serving as the Chairperson for the Session, started the agenda by inviting Mr Wenxi Zhu, Head of the WESTPAC Office, to introduce the agenda items.

8 Mr Wenxi Zhu, serving as the Technical Secretary for the Session, introduced the Provisional Agenda (Document IOC/SC-WESTPAC-X/2 prov.) and the Provisional Annotated Agenda (Document IOC/SC-WESTPAC-X/3.prov.) for consideration by the Sub-Commission. He explained that the Session would be conducted on 12–15 May with the afternoon of 14 May 2015 allocated for sessional working groups, recommendation committee and preparation of the summary report. In addition, field trips were also scheduled for the afternoon of 14 May.

9 **The Sub-Commission adopted** the Agenda without any change and modification, which is attached as [Annex I](#) to this report.

2.2 DESIGNATION OF RAPPORTEUR FOR THE SESSION

10 Dr Khokiattiwong invited the Sub-Commission to designate the Rapporteur for the Session to assist Chairperson and the WESTPAC Office in the preparation of the Session Summary Report. Japan offered to provide the Rapporteur and further proposed Dr Kazumi Wakita to serve as the Rapporteur for this session.

11 **The Sub-Commission accepted** the proposal and **welcomed** Dr Wakita from the delegation of Japan to serve as the Rapporteur.

2.3 CONDUCT OF THE SESSION

12 Mr Zhu introduced the Provisional Timetable (Document IOC/SC-WESTPAC-X/2.add. prov.) and the Provisional List of Documents (Document IOC/SC-WESTPAC-X/1.prov.). He pointed out that the meeting would be conducted in plenary as much as possible with sessional working groups to be formed to deal with specific items arising from the discussions. He also reminded all delegations that the final deadline for the submission of nominations for the elections of the WESTPAC Officers was Wednesday, 13 May 2015 at 17:40 p.m., and the deadline for the submission of draft recommendations was Thursday, 14 May 2015 at 17:40 p.m.

- 13 The Chairperson invited the Session to establish the two statutory sessional committees (Nomination Committee and Recommendation Committee).
- 14 The Delegation of Vietnam proposed Thailand to chair the Nomination Committee, Republic of Korea nominated Japan to chair the Recommendation Committee. This was seconded by several Member States and duly accepted by the Sub-Commission.
- 15 China, as the host for the next International Scientific Symposium, was nominated to chair the Sessional Working Group on the 10th WESTPAC International Scientific Symposium, which was duly accepted by the Sub-Commission.
- 16 **The Sub-Commission noted** the working modality of the Session and the allotted time for each agenda item. **The Sub-Commission also noted** the deadlines for the submission of nominations and draft Recommendations.
- 17 The List of Documents, List of Participants and List of Acronyms are attached as [Annexes IV](#), [V](#) and [VI](#), respectively.

3. STATUTORY REPORTS

3.1 STATEMENT OF THE CHAIRPERSON

- 18 Dr Somkiat Khokiattiwong, in his capacity as Chair of WESTPAC, delivered the Chairperson's Statement (Document IOC/SC-WESTPAC-X/5), providing his insight into the recent developments of the Sub-Commission and his perspective for the coming years and beyond.
- 19 On the occasion of WESTPAC's 25th Anniversary, Dr Khokiattiwong recalled the establishment history of WESTPAC, referring to the first regional programme conducted under the auspices of IOC in the region, i.e., "The Cooperative Study of the Kuroshio and adjacent regions (CSK, 1965–1979)". He highlighted the spirit of cooperation that scientists in the region have been upholding over several generations despite various challenges. He noted that great positive changes have been taking place with WESTPAC since a difficult revitalization process was initiated in 2008, as demonstrated by the ever-growing commitment of its Member States over a number of newly established regional programmes and activities. He highly commended WESTPAC for according high priority to capacity building for young scientists, and its efforts in continuously developing adaptive approaches to capacity development based on regional and national needs. Referring to the WESTPAC initiated capacity building programme "IOC Regional Network of Training and Research Centres (RTRCs) on Marine Science", he noted with great appreciation the strong willingness of several Member States to host RTRCs and expected more RTRCs would be established in the near future.
- 20 With regard to the future of WESTPAC, given a wide range of challenges against limited resources, he further encouraged WESTPAC Member States to strengthen their sense of ownership in order to keep WESTPAC's present momentum. While highly commending the WESTPAC office, particularly Mr Wenxi Zhu and his staff for their high-quality performance and efficient operation, he expected IOC could take motivational measures to keep these staff for a long term as they are "the greatest assets of WESTPAC and IOC". He finally expressed his confidence that WESTPAC will continuously prosper with the continued support of Member States, and extended his sincere thanks for all support received for his chairmanship over the past three years.

3.2 REPORT BY THE HEAD OF THE WESTPAC OFFICE ON INTERSESSIONAL ACTIVITIES AND BUDGET OVERVIEW, INCLUDING THE OPERATION OF THE WESTPAC OFFICE

21 Mr Wenxi Zhu, Head of the WESTPAC Office, reported on the progress since the last session of the WESTPAC (WESTPAC-IX, Busan, Republic of Korea, 9–12 May 2012) (Documents IOC/SC-WESTPAC-X/6).

22 To set a context, Mr Zhu recalled the revitalization efforts jointly made along with all Member States since 2008, which, *inter alia*, led to the establishment of an operational mechanism and collaborative process for Member States to concert their joint efforts in the development and implementation of region-specific programmes, in place of the WESTPAC Advisory Group to rectify the deficiency and provide scientific and technical recommendations on the development of the Sub-Commission, the establishment of a WESTPAC Working Group scheme to provide the early stage development of WESTPAC new programmes/projects in response to emerging issues, and initiation of the self-driven capacity building programme “IOC Regional Network of Training and Research Centers on Marine Science”.

23 With all these strategic planning and effective measures in place, and despite diminishing financial resources from the IOC Regular Budget, WESTPAC has been spearheading marine science development and cooperation in the Western Pacific and adjacent regions as evidenced by considerable activities developed, coordinated and implemented across three identified key thematic areas, namely: ocean processes in the Indo-Pacific, marine biodiversity and food security, and ocean ecosystem health. An estimated 2,025 marine scientists, governmental officials and resources managers directly took part in WESTPAC activities during the last intersessional period, mainly through: the 9th WESTPAC International Scientific Symposium, 4 joint cruises, 16 trainings/summer schools, and 38 regional science development workshops/consultative meetings.

24 Mr Zhu briefed the meeting that all five recommendations adopted by the Sub-Commission at its last session were well implemented. In particular, he highlighted the major accomplishments achieved over the last intersessional period, which included:

- Advocating marine science and strengthening science-policy interface for ocean governance through the organization of the Ninth WESTPAC International Scientific Symposium (Nha Trang, Vietnam, 22–25 April 2014) with close to 600 participants from 21 countries, and the agreement for cooperation on marine science established with the Association of Southeast Asian Nations (ASEAN) in which the health of coasts and ocean was identified for the first time as a programme area in the ASEAN-UNESCO indicative Joint Programme of Action (2014–2018);
- Strengthening sustained ocean observations and services underpinning sustainable development through the development of SEAGOOS Ocean Forecasting System for its second phase, initiation of a regional research and monitoring network to monitor the impacts of ocean acidification on coral reefs, and the conduct of the regional forum on “Charting the Future of Sustained Ocean Observations and Services in the Indo-Pacific”;
- Bolstering institutional capacity for sound management and governance through the development of the “IOC Regional Network of Training and Research Centers (RTRCs) on Marine Science”, and conducting regular topic-specific trainings/summer schools in countries on a rotation basis;
- Leveraging increased commitments of Member States with more extrabudgetary support received in the development, coordination, and implementation of WESTPAC activities.

25 He then gave an overview of the Sub-Commission’s budgetary situation over the last intersessional period (Document IOC/SC-WESTPAC-X/7). Compared to the adopted WESTPAC Programme for May 2012–May 2015 with required funding totaling US\$ 4.2 M, only US\$ 30 K and US\$ 55 K were allocated to WESTPAC for its activities in 2012–2013 and 2014–

2015, respectively. In this sense, almost all WESTPAC activities were implemented through extrabudgetary support, either in-cash or in-kind, from Member States.

26 Notwithstanding the notable achievements made over the last intersessional period, Mr Zhu urged Member States to help address several prominent challenges that are hampering the further development of WESTPAC, including the establishment and strengthening of IOC National Coordinating Mechanisms, and the development of science leaders. In particular, he expressed his concerns over the long-time overloaded and unstable staffing situation in the WESTPAC Office against the overwhelming demands from IOC and Member States in the region for the Office to deliver a wide range of activities.

27 The Chair's Statement and the WESTPAC Office's report generated wide support with various interventions received from a number of delegations. It is evident that WESTPAC's achievements and beneficial effects are convincing enough for Member States to augment their contribution to WESTPAC. Several countries expressed their strong willingness to continue or increase their support to WESTPAC.

28 **The Sub-Commission recognized** the critical importance of their national coordination mechanisms, and **further urged** Member States to strengthen their national coordination mechanisms with a view to engaging, to the greatest extent, their nation-wide expertise in marine science development and cooperation in the region and further leveraging more support from various sources at national level.

29 **The Sub-Commission congratulated** on the substantial achievements WESTPAC has made over the last intersessional period despite extreme constraints of financial and human resources. While highlighting the leadership of WESTPAC in marine science development and cooperation in the Western Pacific and its adjacent regions, **the Sub-Commission further called on** all Member States to continuously provide and elevate their contribution in support of WESTPAC activities, either in-cash or in-kind.

30 **The Sub-Commission highly appreciated** the remarkable efforts made and the pivotal role of the WESTPAC Office in the development of WESTPAC. While noting with sincere concern the understaffed and overloaded situation in the WESTPAC Office, **the Sub-Commission further requested** the Executive Secretary of IOC to take motivational measures for the present staff, **and encouraged** Member States to explore the possibilities of seconding their experts to the WESTPAC Office in order to keep the present momentum.

31 **The Sub-Commission expressed** its appreciation to:

- The Government of Thailand for the provision of office space and facilities for the WESTPAC Office and the secondment of one additional full-time administrative assistant to the WESTPAC Office;
- The Government of Vietnam for having hosted the 9th WESTPAC International Scientific Symposium in Nha Trang, Vietnam, 22–25 April 2014;
- The Government of Thailand for hosting the 10th Session of the Sub-Commission;
- Member States, in particular, China, Japan, Indonesia, Malaysia, Republic of Korea, Thailand, and Vietnam for their continued in-cash and in-kind contribution, such as secondments, provision of research vessels and facilities, and hosting of WESTPAC workshops and training courses.

32 **The Sub-Commission endorsed** the Chairperson's Statement and the WESTPAC Office's report on WESTPAC's intersessional activities and budget overview.

3.3 RECENT DEVELOPMENTS WITHIN IOC/UNESCO, AND ITS RELEVANCE TO WESTPAC

- 33 Dr Vladimir Ryabinin was invited to share his first reflections 74 days after he took the office, and his perspective towards the future of IOC. By recalling the IOC's mandate and the Medium Term Strategy (2014–2021), he briefed that there are a lot of enthusiastic and energetic people in most of IOC global programmes and in all regions, despite that IOC has been operating at a critically low budget with an understaffed and stretched but professional and productive Secretariat. Noting there is a wish for having a very useful and successful IOC, he stressed the need for IOC to conduct broad consultations on its way forward.
- 34 He informed that the UNESCO Executive Board decided to allocate an additional approximately US\$ 1 M to IOC for the biennium 2016–2017 compared to the present biennium 2014–2015. With an approximately \$ 1 M additional allocation for 2016–2017, the IOC proposed to hire a full-time IOCARIBE Secretary in Cartagena, Colombia. The rest of the additional funding represents only a partial restoration to the level of activity funding prior to 2011 for IOC. This funding would be directed to programme activities, with a particular focus on partial restoration of capacity development programmes and the strengthening of regional Sub-Commissions.
- 35 Dr Ryabinin introduced that many new global agendas and regional initiatives with a bearing on ocean presented grand opportunities for IOC. He pointed out the need for IOC to further explore its strong potential in setting oceanographic standards in all its domains, and strengthen its functional autonomy within UNESCO.
- 36 He underscored the importance of IOC Regional Subsidiary Bodies as one of most effective vehicles to translate IOC mandates into actions. He further stressed the need to ensure effective interaction between IOC global and regional components with two-way interaction. He highlighted the achievement that WESTPAC has made over past years and emphasized the need for IOC to capitalize on its strength in the spirit of co-design.
- 37 **The Sub-Commission congratulated** Dr Ryabinin on his new appointment as the Executive Secretary of IOC, and **noted with great appreciation** his perspectives gained within such a short period. **The Sub-Commission expressed** their sincere wish on the bright future of IOC. To help shape the future of IOC and WESTPAC, salient points made in various interventions from delegations and partners are summarized below:
- Possible role of IOC in the promotion of marine scientific research in the areas beyond national jurisdiction, and need for WESTPAC Member States to pay attention to and consider providing scientific inputs to the debates relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (BBNJ);
 - IOC's functional autonomy needs to be visible and strengthened within UNESCO;
 - Leadership of IOC in the promotion and development of sustained ocean observation and services including operational oceanography;
 - Importance of IOC to advance marine knowledge that underpins blue economy;
 - Strong partnership between WCRP/CLIVAR and WESTPAC on ocean climate research;
 - Importance of information sharing among Member States in line with the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (ABS) in order to effectively and smoothly implement WESTPAC biodiversity related programmes.

4. STRATEGIC DEVELOPMENT

4.1 TWENTY-FIFTH ANNIVERSARY OF THE SUB-COMMISSION

38 Mr Wenxi Zhu reported on the WESTPAC's 25th Anniversary celebrations. The Sub-Commission decided at the WESTPAC-IX (Busan, Republic of Korea, 2012) that a series of commemorative activities be planned and organized in 2013–2014 to celebrate the 25th anniversary of the Sub-Commission, with objectives to: (i) take stock of advances in marine sciences and related international cooperation in the Western Pacific and adjacent regions; (ii) promote and demonstrate to governments and to the public the value and importance of the Sub-Commission's achievements; and (iii) plan for its future directions in marine science and related services.

39 Following up on this Recommendation, a wide range of commemorative events flagged for the 25th Anniversary were conducted during the period of late 2013–2014 at regional and national level, including joint cruises, scientific workshops, 9th WESTPAC International Scientific Symposium, trainings and summer schools, publications and outreach. These commemorative activities have generated wide positive impacts towards the future marine science development. It is evident that IOC's leadership in marine science in the region has been developed and strengthened through its WESTPAC.

40 He further pointed out that WESTPAC should continue to develop closer links among scientists, institutes and countries in the region, and intensify its efforts to continue cultivating marine science talent, developing sustained observations and relevant infrastructure, and sharing the knowledge and data through capacity development activities in the region, in particular through the development of technical assistance programmes and materialization of the "IOC Regional Network of Training and Research Centres (RTRCs) on Marine Science".

41 While congratulating on the successful accomplishment of WESTPAC's 25th Anniversary, **the Sub-Commission expressed** its great appreciation to these Member States, and the WESTPAC Office for its remarkable efforts in the planning, development and coordination of these commemorative activities.

4.2 RECOMMENDATIONS FROM THE NINTH WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM 2014

42 Dr Vo Si Tuan, Chair of the Local Organizing Committee of the 9th WESTPAC International Scientific Symposium, presented the outcomes and lessons learned from the event that was organized on 22–25 April 2014, Nha Trang, Vietnam. The objective of the Symposium, entitled "A Healthy Ocean for Prosperity in the Western Pacific: Scientific Challenges and Possible Solutions", was to bring together marine scientists with a view to examining the achievements of WESTPAC in marine sciences over the last 25 years, advancing marine scientific knowledge, and catalyzing multi- and cross-disciplinary collaborations towards the improvement in management practices and decision-making processes for sharing the wealth of the ocean to benefit all.

43 This symposium attracted immense interest with close to 600 scientists, governmental officials and resources managers from 21 countries, within and outside the WESTPAC region, involved in this landmark event. The Symposium featured: one Research Directors Forum, six keynote speeches, 14 sessions, and 9 workshops, which are structured around four themes: (1) Understanding ocean processes and climate in the Indo-Pacific Region; (2) ensuring marine biodiversity, food safety and security; (3) maintenance of ocean health; and (4) cross-cutting and emerging issues.

44 WESTPAC organized its first-ever Research Directors Forum, as an integral part of this Symposium, to provide an open-ended platform for directors from marine scientific institutes,

academic faculties and/or operational agencies in the Indo-Pacific region, build and enhance networks; exchange strategic directions of their institutions; identify scientific and technical challenges; and spark regional actions for future collaboration by exploring any opportunity, synergizing existing and planned observations, and furthering operational oceanography in the Indo-Pacific region. This Forum culminated in the signing of a Joint Statement of Research Directors towards the attainment of the future we want: “A Healthy and Safe Ocean for Prosperity in the Indo-Pacific Region.” (<http://iocwestpac.org/news/392.html>)

45 This symposium also witnessed the establishment of the inaugural “WESTPAC Outstanding Scientist Award” to honor marine scientists for their long-term dedication to regional marine science development and cooperation. WESTPAC awarded its Best Young Scientist Award 2014 on 24 April 2014 to five outstanding young scientists from the region in order to encourage young scientists to devote themselves to marine science (<http://iocwestpac.org/news/396.html>). To nurture young science leaders and heighten international exposure of young scientists under the age of thirty-five, the WESTPAC Young Scientist Travel Grant was established with generous financial support from the Government of Vietnam, the Korea Institute of Ocean Science and Technology, and the State Oceanic Administration of China. Fifty young scientists were provided with partial or full financial support to enable their participation in the symposium.

46 Dr Tuan finally briefed the meeting on a series of valuable recommendations made from the Symposium, with focus on the following subjects for the future research and development in the Western Pacific and its adjacent regions, which included: sustained ocean observations and services, in particular, the emerging Indo-Pacific Ocean Observations and Services Network (IPON), development of ocean forecasting system, ocean acidification and its impact on marine ecosystems, atmosphere and ocean circulation and sea-air interaction, coastal erosion and coastal hazards such as storm surge, ecosystem restoration techniques/methods, and vulnerability assessment methodology and tools.

47 Following Dr Tuan’s report, Dr Youn-Ho Lee briefed the meeting on the status on the publication of the special volume of *Ocean Science Journal* (OSJ). To this end, a Guest Editorial Board was established before the Symposium. After the Symposium, 55 papers were submitted from 14 Member States to the Journal among about 400 papers presented at the symposium. The special volume was expected to be published at the end of June 2015, shortly after the completion of a strict reviewing process. He informed Member States that the special volume would be widely distributed in order to advertise the substantial achievements of WESTPAC. The electronic versions will be freely downloadable through the website of the OSJ publisher, Springer. This was the first time for WESTPAC to publish papers presented at the WESTPAC scientific symposium as a special volume, which demonstrated the joint efforts and ever-increasing spirit of cooperation among Member States in the region. He finally suggested that it should become a regular practice to publish papers presented at the WESTPAC International Scientific Symposia.

48 **The Sub-Commission congratulated** Dr Vo Si Tuan, Dr Youn-Ho Lee, the National Organizing Committee, the International Scientific Steering Committee and the WESTPAC Office on the successful organization of the 9th WESTPAC International Scientific Symposium, Nha Trang, Vietnam 2014; and **expressed** its sincere appreciation to the Government of Vietnam for having hosted and providing tremendous support for this Symposium.

4.3 THE PREPARATIONS FOR THE TENTH WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM 2017, QINGDAO, CHINA

49 Dr Weidong Yu, First Institute of Oceanography, State Oceanic Administration, China, informed the meeting of the preparatory efforts made thus far for the 10th WESTPAC International Scientific Symposium to be held in Qingdao, China, 2017.

50 Since China expressed its offer in April 2014 to host the 10th WESTPAC International Scientific Symposium, several national meetings were held among relevant institutes, academies and ministries. A National Organizing Committee will be established with members from relevant institutions with the State Oceanic Administration of China designated as the host agency and its First Institute of Oceanography as the local organizer. A tentative timeline for the Symposium was also presented.

51 A Sessional Working Group on the 10th WESTPAC International Scientific Symposium was formed under the chairmanship of China. The Group conducted their work during the Session, and further proposed the following list of immediate actions to be taken after the Session:

- release the first Announcement at the upcoming 28th Session of the IOC Assembly (Paris, 18–25 June 2015) containing key information on date, venue, theme and sub-themes, generic timeline, potential publication and programme highlights, such as WESTPAC Outstanding Scientist Award, WESTPAC Best Young Scientist Award, and WESTPAC Young Scientist Travel Grant;
- establish the International Scientific Steering Committee (ISSC), as early as possible. In consultation with the host country, ISSC will shape the overall structure of the 10th Symposium;
- propose several themes and dates options of the Symposium for discussion among ISSC;
- communicate with all WESTPAC Projects and Working Groups to propose events in conjunction with the 10th Symposium;
- explore the possibility of a joint session on early career scientists with PICES/ICES, optimize the timeline based on experience learned from previous symposiums;
- have a side meeting during the 28th Session of the IOC Assembly ; and
- explore the possibility of engaging ocean technology enterprise exhibition into the Symposium.

52 **The Sub-Commission thanked** the Government of China for its kind offer to host the 10th WESTPAC International Scientific Symposium in 2017 and the preparations made thus far. **The Sub-Commission further suggested** the International Scientific Steering Committee be established as early as possible to develop and finalize, with reference to the recommendation of the Sessional Working Group, the theme, sub-themes and programme.

53 **The Sub-Commission reviewed and adopted** [Recommendation SC-WESTPAC-X.1](#) pertaining to the 10th WESTPAC International Scientific Symposium.

4.4 WESTPAC APPROACH TO CAPACITY DEVELOPMENT

54 Mr Wenxi Zhu introduced the WESTPAC approach to capacity development, referring to Document IOC/SC-WESTPAC-X/12.

- 55 As a result of the revitalization process since 2008, and responding to the requirements of international instruments (World Summit on Sustainable Development, Rio+20, UN Regular Process) and Member States, the Sub-Commission started to employ adaptive and self-driven approaches to capacity development in the region with guiding principles to prioritize the inclusion of capacity development as one of key components in WESTPAC programmes in order to attain their research goals, focus on regional and national needs, and foster North-South and South-South cooperation.
- 56 Mr Zhu briefed the meeting that the current main approaches of WESTPAC to capacity development embody: development of “IOC Regional Network of Training and Research Centres on Marine Science” through the establishment of IOC Regional Training and Research Centres (RTRCs) in national marine research institutes and/or universities and provision of regular trainings on the specialization focus of these Centers to young scientists; conduct of topic-specific trainings in Member States on a rotation basis; “Training Through Research” to engage early career scientists into WESTPAC research programmes; and establishment of “WESTPAC Best Young Scientist Award” and “WESTPAC Young Scientist Travel Grant” to nurture young science leaders and facilitate international exposure of young scientists.
- 57 Japan briefed the meeting on the results of the “International Feasibility Study Workshop towards the establishment of an IOC Regional Training and Research Centre (RTRC)”, (Kashiwa, Japan, 18–19 November 2014). National perspectives were provided on the establishment of other RTRCs towards the “IOC Regional Network of Training and Research Centers on Marine Science” in the region, including Indonesia hosting a RTRC on Tropical Marine Biodiversity at its Research Center for Oceanography, LIPI; Malaysia hosting one RTRC on HAB species characterization and detection at its University of Malaya; Singapore hosting a RTRC on Harmful Algal Blooms at its National University of Singapore; and Vietnam hosting a RTRC on Marine Toxins and Seafood Safety at its Institute of Oceanography, VAST.
- 58 With clarification made on the IODE’s Ocean Teacher Global Academy project that is going to set up its Regional Training Centres (RTCs) in various regions, **the Sub-Commission recognized** the difference in nature between the WESTPAC’s RTRC initiative and the IODE’s Ocean Teacher Global Academy (OTGA) project. The WESTPAC’s RTRC initiative has been establishing RTRCs based on the host institution’s scientific specialization and recognition with emphasis on combined training modes of face-to-face training, hands-on exercises and training-through-research. However, the IODE OTGA project is intended to promote the establishment of RTCs using an internet-based distant system to provide trainings with a focus on data and information management.
- 59 In response to an inquiry concerning the inclusion of WESTPAC approaches in the newly drafted IOC capacity building strategy, Mr Zhu clarified that several WESTPAC Member States had been engaged in the IOC Intersessional Working Group on IOC capacity building strategy with most of WESTPAC approaches well incorporated in the latest draft.
- 60 **The meeting highly appreciated** the remarkable efforts WESTPAC made in over the past years in initiating various capacity building tools and programmes in view of user needs at regional and national levels, in particular, its initiative of IOC Regional Network of Training and Research Centres on Marine Science which was adopted at the 7th Session of WESTPAC (WESTPAC-VII, Sabah, Malaysia, 26–29 May 2008), and endorsed subsequently by IOC at the 41st session of its Executive Council (IOC/EC-XL, Paris, 24 June–1 July 2008).
- 61 **The Sub-Commission underscored** the importance for WESTPAC to keep developing and strengthening marine science capacity of developing nations, including Small Island Developing States (SIDS), in the Western Pacific and its adjacent regions in order to advance sustainable ocean governance at all levels;

62 While keeping in mind the recommendations of the 9th WESTPAC International Scientific Symposium (Nha Trang, Vietnam, 22–25 April 2014) and the UNESCO-ASEAN Framework Agreement for Cooperation (2014–2018), **the Sub-Commission stressed the need** to continuously develop this regional network of RTRCs, aiming to strengthen regional and national capacity in a sustainable and systematic manner with guiding principles to foster North-South and South-South collaboration, and to develop training programmes leading to the attainment of research goals.

63 **The Sub-Commission noted with great appreciation** the strong willingness of Member States and their institutions to host regional training and research centres on their specialized fields, and **further recommended** the WESTPAC Office conduct further consultations with interested countries and institutions on the preparations of detailed proposals for hosting IOC regional training and research centers in accordance with adopted guidelines and procedures.

5. REVIEW AND EVALUATION OF REGIONAL PROGRAMMES, PROJECTS AND WORKING GROUPS FOR MAY 2012–MAY 2015

64 Dr Somkiat Khokiattiwong provided a brief overview of WESTPAC programmes, projects and working groups, and called on each programme/project leader and working group chairperson to provide an in-depth assessment of their progress.

5.1 OCEAN PROCESSES AND CLIMATE IN THE INDO-PACIFIC

5.1.1 North East Asian Regional-GOOS

65 Dr Joon-Soo Lee from the Korea Oceanographic Data Center, National Fisheries Research and Development Institute of the Republic of Korea, representing the WESTPAC Coordinating Committee for the North East Asian Regional-GOOS (NEAR-GOOS), presented the background, objectives, the implementation of NEAR-GOOS over the past three years, and the efforts made by each of the participating countries including the amount and types of data transmitted in both real-time and delayed modes, data network development, data products and related services provided, and the amount of users that have benefitted from the services provided by NEAR-GOOS. National observing systems and operational oceanographic systems have been developed in four participating countries and will continue to contribute to NEAR-GOOS.

66 Dr Lee also presented the future plan of NEAR-GOOS with objectives to strengthen regional function of these designated regional databases and their interaction with other national databases, improve accessibility of national databases, establish the Working Group on NEAR-GOOS Products to improve NEAR-GOOS services, and reform the Working Group on Data Management for the efficient and effective operation of the NEAR-GOOS database system.

67 A Sessional Working Group on NEAR-GOOS was formed during the Session with the participation of NEAR-GOOS participating institutions from China, Japan, Republic of Korea and Russia. The Group updated the list of NEAR-GOOS CC members from each country and decided to organize the next meeting of NEAR-GOOS CC in November or December 2015 subject to the final confirmation of the Japan Meteorological Agency.

68 **The Sub-Commission noted** with appreciation the efforts made and **further encouraged** the WESTPAC Coordinating Committee for NEAR-GOOS to intensify their efforts in revitalizing NEAR-GOOS through the improvement on the data-exchange network, advocacy of its services, and development of more collaborative observation programmes in the NEAR-GOOS region.

69 **The Sub-Commission recommended** that the Coordinating Committee should continue to develop sustained observation programmes, either bilaterally or multilaterally, such as the ongoing synchronized observations/cruises, to further realize the objectives of NEAR-GOOS.

5.1.2 South East Asian Regional-GOOS, including Monsoon Onset Monitoring and its Social & Ecosystem Impacts, Ocean Forecasting Demonstration System

70 Dr Somkiat Khokiattiwong, Coordinator for the South East Asian Regional-GOOS (SEAGOOS), briefed the meeting on the establishment history and the need for SEAGOOS to develop pilot projects to demonstrate the value of ocean observations and services for social and ecosystem impacts. Two pilot projects have been developed and implemented since 2009, namely on, “Monsoon Onset Monitoring and its Social & Ecosystem Impacts” (MOMSEI) and “Ocean Forecasting Demonstration System” (OFS). He also briefed the meeting on the new initiative to be established on the “Development of a Regional Network of Ocean Acidification”.

71 Dr Weidong Yu from the First Institute of Oceanography, State Oceanic Administration (SOA) of China, was invited to report on the progress made on the pilot project “Ocean Forecasting Demonstration System” (OFDS). He reviewed the objectives of OFDS to develop an ocean forecasting demonstration system for the targeted region, enhance the understanding of oceanographic processes in the region; and provide a platform for ocean modelers, especially young scientists from this region to network and share their knowledge.

72 He reported that since the OFDS Web Portal was launched at the WESTPAC-IX in 2012, the operational forecasting products have been provided through the website. Other activities included regional workshops for defining workplans, joint cruises for model validation, training courses conducted for developing the capacity of young scientists in the OFDS team, and four publications published in international journals. Building upon previous accomplishments, all participating countries decided to rename the project as “Ocean Forecasting System” (OFS), and continue the development of the ocean forecasting system in the key areas of work, including: extension of OFDS geographic coverage to cover the region of (20°S-20°N, 80°E-145°E); development of higher-resolution model in selected sub-domains upon the request of participating countries; improvement of current OFDS Web Portal on accessibility and model forcing and boundary conditions download, and online analysis tools, Installation of OFS in Thailand and Indonesia in 2015, and updating of OFS in Malaysian Meteorological Department in late 2015.

73 He then reported on the progress made on the pilot project “Monsoon Onset Monitoring and its Social & Ecosystem Impacts (MOMSEI)”. While stressing the importance of monsoon for the livelihood of people in the region, he briefed on the development strategy, including learning through the pilot study, identifying national and regional concerns, and development of a comprehensive plan. Several cruises were conducted over the last intersessional period. Three MOMSEI Summer Schools were held, respectively on 6–10 August 2012, 19–23 August 2013 and 9–13 September 2014, to build the capacity of young scientists on monsoon dynamics, coral biology and ecosystems, and ocean observations.

74 **The Sub-Commission noted** with appreciation the tremendous progress made in the development of SEAGOOS, particularly its present two pilot projects, namely Ocean Forecasting System (OFS), and Monsoon Onset Monitoring and its Social & Ecosystem Impacts (MOMSEI), and **further recommended** that the OFS develop a clear roadmap (or strategic plan) at both regional and national level, over the next five years and beyond. **The Sub-Commission also recommended** that the MOMSEI Science Plan be made available, as soon as possible, building upon the scientific knowledge acquired and lessons learnt over its pilot phase, with a view to further disseminating its scientific focus and engaging additional Member States that are interested in the research and monitoring of monsoon onset.

5.1.3 Response of Marine Hazards to Climate Change

75 Dr Weidong Yu presented the implementation status of this project since it was established at the WESTPAC-VIII (May 2008, Sabah, Malaysia). This project aimed to bring together scientists to share and advance their scientific knowledge by means of field observation, model development, capacity building, and process study on the variability of marine hazards in relation to climate change.

76 He reported that a total of five international joint cruises were carried out in the South China Sea and the Gulf of Thailand. The state-of-the-art wave-tide-circulation coupled model and the First Institute of Oceanography - Earth System Model (FIO-ESM) were developed with inclusion of the effects of surface wave-induced vertical mixing. Four international workshops were organized to review its implementation and plan its future activities. He highlighted that scientific understanding on sea level rise, typhoon intensity, vertical mixing in the upper ocean and subsurface eddy were greatly improved, as evidenced by several publications contributed by scientists from participating countries. Given the limited financial resources and accomplishment of its objectives, he suggested that this project be merged into the SEAGOOS Ocean Forecasting System.

5.1.4 Air-Sea Interaction in the Kuroshio Extension and its Climate Impact

77 Dr Xiaopei Lin from the Ocean University of China presented the progress made since it was established at the WESTPAC-IX (Busan, Republic of Korea, May 2012). The Kuroshio extension region plays a crucial role in the North Pacific climate system due to the intense and complex air-sea interaction along the sharp oceanic front of the Kuroshio. By focusing on the multiscale air-sea interaction in this region and its climate impact, this project aims to establish a theoretical framework of the multiscale ocean-atmosphere interaction in the mid-latitudes, develop a sustainable observation network, reveal key physical processes in determining climate change and improve the understanding of ocean and climate predictability in the Western Pacific.

78 During the last intersessional period (May 2012–May 2015), four major activities were carried out, such as the second ‘International Symposium on Boundary Current Dynamics’, an international workshop on future observation plan, three national research projects with a focus on the Kuroshio extension region and two research cruises in the Northwestern Pacific Ocean. The accomplishment of these activities not only provides the scientific support for the enhancement of prediction capability of climate models, but also promotes interdisciplinary integration as well as international communication and cooperation in observation and research in the Kuroshio extension region. Dr Lin reported that the project has engaged more international scientists into the planning and implementation of this project, and would enhance communications with the WESTPAC Office concerning its activities, and further improve its visibility in the WESTPAC region.

5.1.5 South China Sea Fluvial Sediments and Environment Changes

79 Ms Yanli Li, presenting on behalf of Professor Zhifei Liu from Tongji University, China, highlighted the achievements of this project over the last three years. The WESTPAC-FluSed project (2012–2015) was designed to investigate fluvial sediments surrounding the South China Sea in order to further understand how human activities affect the sediment discharge and to predict future changes.

80 International workshop, fieldwork and research cooperation, bilateral scientific visits, and young scientist and graduate student training were carried out to achieve the project’s objectives. Three regular international workshops on the Fluvial Sediment Supply to the South China Sea were successfully held in Bandung (Indonesia), Selangor (Malaysia), and Kota Kinabalu (Malaysia), respectively, with a total of 90 participants participating. Topics of sediment

discharge, coastline and delta evolution, and sedimentation in the South China Sea were discussed. Four fieldwork sessions or cruise excursions with related research cooperation activities were carried out. River sediment sampling fieldwork sessions were organized in Vietnam and China to collect sediment in almost all major rivers in the region in order to measure clay mineralogy and elemental geochemistry. An oceanography cruise was embarked on in the Gulf of Tonkin to collect sediment cores. A special issue of an international scientific journal (Journal of Asian Earth Sciences) was published with six peer-reviewed papers. Eight bilateral visits and related collaborations were conducted, and fourteen young scientists from Vietnam, Thailand, Malaysia, Philippines, and Indonesia visited the Tongji University for either long-term graduate programme or short-term laboratory analysis training.

- 81 She further informed the meeting that the Project Leader and the Project Steering Group will improve communications with the WESTPAC Office on its activities so that the information on those activities could be widely circulated and establish smooth linkages with their IOC National Focal Points for WESTPAC in order to leverage more support from their national sources.

Summary of the WESTPAC Advisory Group on the theme
of "ocean processes and climate in the Indo-Pacific"

- 82 Dr Weidong Yu gave a short summary on behalf of the WESTPAC Advisory Group with regard to all WESTPAC activities under the umbrella theme of "ocean processes and climate in the Indo-Pacific". Outstanding progresses have been achieved along with highlights on the improved observing capacity spanning from the Indian Ocean to the Pacific Ocean and covering coastal areas to deep oceans. In addition, the database operation has been improved remarkably with NEAR-GOOS running real-time and delayed mode databases. Lastly, efforts in capacity building, which included summer schools, workshops and exchange visits, were highly commended by the Sub-Commission.

- 83 Points to be enhanced were mainly related to the NEAR-GOOS: some national portals are not working well, and sustainable observation is still lacking. The latter also applies to the SEAGOOS. It was also discussed that science plans need to be developed and that WESTPAC visibility should be further increased across all programmes and projects.

- 84 The Group further recommended that cooperation could potentially be established with ongoing or emerging programmes/initiatives such as the Tropical Pacific Observing System 2020 (TPOS 2020), International Indian Ocean Expedition-2 (IIOE-2), Year of Maritime Continent (YMC), and the Bay of Bengal Large Marine Ecosystem project (BOBLME). Regional cooperation must also be considered with initiatives like World Climate Research Programme/Climate Variability and Predictability (WCRP/CLIVAR) and International Ocean Carbon Coordination Project (IOCCP). It was lastly suggested that the Cooperative Study of the Kuroshio and Adjacent Regions (CSK 1965-1979) should be revisited.

- 85 In response to the recommendation on CSK-2, a Sessional Working Group on CSK-2 was formed to identify possible actions to be taken in the next intersessional period. The Group finally suggested that WESTPAC establish an open-ended Intersessional Task Force on CSK-2, under the leadership of Dr Kentaro Ando (Japan) with an initial membership of Dr Xiaopei Lin (China), Dr Vo Si Tuan (Vietnam), Drs Yang-Ki Cho & Joon-Soo Lee (Republic of Korea), Dr Gil Jacinto (Philippines), Dr Zainal Arifin (Indonesia), and Dr Vyacheslav Lobanov (Russian Federation). The Task Force would be mandated to conduct a feasibility study on CSK-2.

- 86 **The Sub-Commission reviewed and endorsed** the recommendation of setting up an open-ended International Task Force on the Feasibility Study of CSK-2 with an initial membership suggested as above. **The Sub-Commission further urged** the Task Force to conduct their work as soon as possible.

5.2 MARINE BIODIVERSITY, HEALTHY ECOSYSTEMS, SEAFOOD SECURITY AND SAFETY

5.2.1 Marine and Coastal Biodiversity and Conservation

87 Dr Suchana Chavanich from Chulalongkorn University, Thailand, reported that the project had focused on three main pillars: biodiversity and taxonomy of marine organisms, effects of disturbance/stressors on biodiversity, and restoration/rehabilitation of ecosystems. In light of these emerging issues, activities were organized in the last intersessional period that included: 1) conducting two workshops related to coral restoration techniques and soft coral taxonomy in order to summarize the techniques that have been used/experimented in WESTPAC countries and diagnose classification problems respectively, in order to advance and share knowledge on the subject; 2) publishing a pamphlet on coral reef restoration techniques to share knowledge and raise awareness of the possibilities; 3) conducting a workshop at the 9th Scientific Symposium in Vietnam on marine and coastal biodiversity and conservation to increase visibility; and 4) disseminating the outcomes at the 3rd world conference on marine biodiversity in Qingdao, 2014; and 5) collaborating with international activities such as the North Pacific Marine Science Organization (PICES), UNEP Northwest Pacific Action Plan (NOWPAP) and UNESCO Thailand for joint activities.

88 She explained that attention will be paid to the same three pillars, but with different sub-topics such as identifying marine alien species, monitoring the impact of ocean acidification on biodiversity and summarizing other ecosystem restoration techniques such as on mangroves and seagrass beds. Following the recommendations from the WESTPAC Advisory Group made in December 2014, she highlighted the importance of this project to pay close attention to emerging marine biodiversity related issues/initiatives and define an integrated research framework for marine biodiversity and conservation. She also stressed the need to explore any possibility of collaborations with other biodiversity-related projects.

89 Given the environmental, social and economic importance of marine and coastal biodiversity to the livelihood of people in the region, strong support was received from Member States at the meeting to continue developing this project.

5.2.2 Coral Reef under Climate and Anthropogenic Perturbations

90 Dr Thamasak Yeemin from Thailand, briefed the meeting on behalf of Professor Jing Zhang on the key activities conducted over the last three years. The project's objectives are to 1) understand the biogeochemical and ecological nature of coral reefs; 2) evaluate the consequence of climate change of health on coral reefs; and 3) promote capacity building by sharing scientific knowledge. Upon its establishment in 2008, four international workshops were organized with each having been attended by 20-30 participants, and three international summer schools were conducted with a total number of 70-80 post graduate students and young scientists trained for the study of coral ecosystems under the impact of climate change and anthropogenic impacts. A special issue was published in the Deep-Sea Research II with 12 articles contributed by 57 researchers from 10 countries in the region, covering important aspects of coral reef ecosystems from hydrological, chemical, ecological, and environmental approaches, to examine the natural and anthropogenic impact on the sustainability of coral reefs in the Western Pacific region.

91 He also highlighted the need to enhance the network to include more researchers in the region, particularly those from the Pacific island countries, and develop partnerships with other coral reef-related research projects within and outside the region with a view to advancing knowledge on the resilience of coral reefs to climate change and anthropogenic disturbances.

- 92 The presentation prompted extensive interests with wide support received from many countries at the meeting. It was suggested that this project should work in collaboration with the International Coral Reef Initiative (ICRI) and Global Coral Reef Monitoring Network (GCRMN) on the preparations of assessment reports on the status of coral reefs in WESTPAC countries. **The Sub-Commission recommended** that Project Leader should consider scoping down the project objectives, and developing collaborations with other coral reef related projects and activities.

5.2.3 DNA Taxonomy and Recruitment Monitoring of the Coral Reef Marine Organisms

- 93 Dr Youn-Ho Lee reported that the project has been implemented since March 2013 with funding sought from the Korean Funds-in-Trust for UNESCO. This project aims to enhance national and regional capacity for species identification and genetic analysis of coral reef organisms in WESTPAC countries, establish a genetic marker called DNA barcode for each species as a standard measures for objective identification, build an inventory of marine organisms and share information among the member countries for assessment of biodiversity, and monitor recruitment of the reef organisms by analyzing larvae and fries. During the 1st phase, five WESTPAC countries including Indonesia, Malaysia, Philippines, Thailand, and Vietnam, have contributed about 1000 data entries in the open inventory in the WESTPAC marine biodiversity portal site. The inventory contains information on each species with regard to taxonomy, distribution, photos, description, and DNA barcode if it could be obtained. A training course was also conducted on recruitment monitoring of coral reef organisms in Nha Trang, Vietnam, 20–21 April 2014 before the 9th WESTPAC Scientific Symposium. A total of 30 participants attended the training course, expressed their satisfaction on the training, and agreed to apply the learned techniques in their research. In closing, he expressed the possibility of the Government of the Republic of Korea to provide funding to WESTPAC in support of the 2nd phase of this project.
- 94 This report prompted extensive interests with several suggestions made from the floor, including the possibility of expanding the database to include microalgae and developing a standard protocol for DNA barcoding, close cooperation with taxonomic experts, transfer of knowledge to benefit other countries in the region, linkage to the Coral Triangle Initiatives (CTI) and possible contribution to IOC's Ocean Biogeographic Information System (OBIS).
- 95 The delegation of the Republic of Korea informed the meeting that the Government of the Republic of Korea would provide continuous financial support to the 2nd phase of this project in consideration of the high spirit of cooperation demonstrated among participating countries and substantive progress made in the first phase.
- 96 **The Sub-Commission expressed** its appreciation to the Republic of Korea for its generous support for the development and implementation of this project, **and further recommended** that Dr Lee and the WESTPAC Office start the development of activities for its second phase, and consider developing mirror sites of the project portal in participating institutes.

5.2.4 Marine Toxins and Seafood Safety

- 97 Dr Vo Si Tuan, representing Dr Dao Viet Ha from the Institute of Oceanography, Vietnam, briefed the meeting that concrete actions have been undertaken to improve the awareness of the local community on natural biotoxins in marine organisms and its risks to human health within the Western Pacific region through identifying toxic marine organisms and disseminating relevant scientific information to the public. A series of workshops, training courses and other associated activities were conducted to address the challenges of a recent increase of seafood poisoning in the region. Dr Tuan emphasized the need for WESTPAC to build research and monitoring capacity for toxic organisms. Furthermore, outreach and awareness programmes need to be continuously developed among member states to minimize

the risk of seafood poisoning to human health. Therefore, in the next phase of 2015–2020, efforts will be made to continuously build the knowledge base and capacity of marine toxin study and monitoring for seafood safety in the region.

- 98 Wide support was expressed by several Member States in light of the close link of this project to human health. Suggestions were made on the need to continue building public awareness on marine toxins.

5.2.5 Harmful Algal Blooms

- 99 Dr Mitsunori Iwataki, University of Tokyo, Japan, emphasized the need for WESTPAC to continuously develop HAB related studies given that fish kills and shellfish/fish poisoning have been occurring in the region. He updated the meeting with a HAB scientific framework, covering various aspects including the identification, taxonomy and distribution (biology), ecophysiology (biology), toxicology (chemistry) and newly added component on socio-economic analysis.

- 100 He briefed on the progress made over the past intersessional period. At the two strategic workshops, respectively in Changwon, Republic of Korea in October 2012 and in Nha Trang, Vietnam in April 2014, the project reviewed HAB events in the region and recognized the importance of capacity building and scientific activities such as training courses and distribution of reference publication and laboratory items. Current status of HAB occurrences in Member States is still problematic. HABs become more serious in terms of prolongation of the occurrence period and the widening of HAB species distribution. New types of threats, e.g., red tide occurrences of *Gonyaulax polygramma*, *Phaeocystis globosa*, *Noctiluca scintillans* in Hai Phong, Vietnam, *Karlodinium australe* between Malaysia and Singapore, and *Cochlodinium polykrikoides* in Lampung Bay, Indonesia, were recognized and information was shared with the steering members. He further stressed the importance of international collaboration for unambiguous identification of the HAB events and causative species, and capacity building activities.

- 101 Responding to recent HAB-related massive fish kills in Malaysia and Singapore, he explained that two local training workshops were held in Bachok, Malaysia and in Singapore, August 2014, respectively, with focus on the establishment of HAB monitoring systems and identification of red tide species. He pointed out that it would be more effective if WESTPAC could develop more country-specific capacity building activities based on their needs. Furthermore, a book entitled “Marine Phytoplankton of the Western Pacific” (ISBN 476991282X, 9784769912828, Takuo Omura, Mitsunori Iwataki, Valeriano M. Borja, Haruyoshi Takayama, Yasuwo Fukuyo), containing a number of photos of marine microalgae including harmful algal species, was published in October 2012 as a result of close collaboration among HAB scientists in the region. This book has been utilized as training material for the standardization of micro-algal species identification.

- 102 Dr Iwataki finally pointed out that it would be more effective if WESTPAC could develop more country-specific capacity building activities based on their needs and keep in mind that the following challenges need to continuously be addressed: the socio-economic impacts caused by HABs, compilation of economic losses, sharing of mitigation measures, and proper coastal management. Given the inclusion of a new component on socio-economic analysis, he pointed out the challenges including the lack of relevant information on economic losses by HABs and mitigation measures.

- 103 Dr Kazumi Wakita was invited to introduce the social science approach to HAB related socio-economic analysis. Briefing on direct and indirect impacts of HABs on the society, she explained that calculation methods of economic losses and questionnaire developments are main research objects of social science. She emphasized that this component can be conducted, taking advantage of strong network established among WESTPAC Member States and accumulated HAB related scientific knowledge. Therefore, she further invited all Member

States who are interested to nominate their experts, if any, to join in the HAB related socio-economic analysis.

5.2.6 Ocean Remote Sensing for Coastal Habitat Mapping

104 Dr Teruhisa Komatsu from the University of Tokyo, Japan, informed the meeting of the progress of the Ocean Remote Sensing for Coastal Habitat Mapping. From 2012 to 2015, the project aimed to establish a network of researchers working on remote sensing studies with a focus on coastal habitat mapping, and to standardize methods to map seagrass beds suitable for the WESTPAC region. The third workshop on Ocean Remote Sensing for Integrated Coastal Area Management: Coastal Habitats Mapping (III) was organized in Nha Trang, Vietnam, on 24 April 2014 during the 9th WESTPAC International Scientific Symposium. The workshop reviewed seagrass mapping as the coastal habitat mapping for ICAM in each member country. Standardized analysis methods in WESTPAC were proposed and adopted, one of which is the Depth Invariant Index and another is the Bottom Reflectance Index.

105 The fourth training workshop was conducted at the Institute of Oceanography in Nha Trang after the 9th WESTPAC Scientific Symposium from 25 to 27 April 2014. This workshop was designed for beginners of coastal habitat mapping for ICAM to share with trainees radiometric methods of the Depth Invariant Index and Bottom Reflectance Index.

106 Dr Komatsu informed the meeting that studies on temporal changes in seagrass habitats using these methods would be conducted in Member States and ground-truthing methods must be standardized and shared among the participants. Thus, the next training workshop will focus on sea-truthing methods of seagrass habitats, which will be held in Thailand in 2015.

107 He highlighted that habitat maps can be used for delivering our understanding of habitat distributions in selected areas to local people and stakeholders with standardized remote sensing methods for integrated coastal management. Detected changes could provide insights on alterations in environmental settings as a result of anthropogenic impact and climate change.

108 An inquiry was made on whether the project will also focus on coastal habitats other than seagrasses. The response was that technical and financial limitations prevented the project from including mangroves and coral reefs for the time being.

Summary of the WESTPAC Advisory Group on the theme of "marine biodiversity, healthy ecosystems, seafood security and safety"

109 Dr Suchana Chanavich provided an overview of all the activities that have taken place under the agenda item 5.2: marine biodiversity, healthy ecosystems, seafood security and safety. She informed the session that the output has been outstanding and included capacity building activities such as workshops and summer schools; successful accounts of data collection and analysis; transfer of new technology, such as DNA analysis, satellite image analysis, coral restoration techniques and HAB detection techniques; and the successful dissemination of projects via scientific papers, books, pamphlets and at international conferences.

110 Dr Chavanich furthermore suggested that WESTPAC interdisciplinary networks could be utilized to extend the scope of the project to include topics such as ocean acidification. Projects such as the DNA taxonomy, marine biodiversity and HABs can all contribute data to a project on ocean acidification. She stated that in order to gain more collaboration with external organizations, the visibility of WESTPAC projects must be enhanced and information should be shared that can be further implemented by local and national governments.

5.3 ENHANCED KNOWLEDGE OF EMERGING OCEAN SCIENCE ISSUES

111 Dr Somkiat Khokiattiwong introduced this agenda item, explaining that four WESTPAC Working Groups were formed in accordance with the adopted Guidelines for the Establishment of WESTPAC Working Groups, respectively on Asian Dust and its Impact on Ocean Ecosystem (ADOES); World Ocean Assessment (Regular Process); Mapping Harmful Jellyfishes; and Marine Renewable Energy Technology Development.

5.3.1 WG 001: Working Group on Asian Dust and its Impact on Ocean Ecosystem

112 Dr Mitsuo Uematsu, Co-Chair of this Working Group, reported on the progress made. He informed the Session that ADOES has achieved its preliminary goals to identify the sources of Asian dust to the northwestern Pacific and realized the importance of dust deposition on marine biogeochemistry. It has been shown that Asian dust from northwest China, especially coming from Gobi desert at the boundaries of China and Mongolia could be transported to and have impact on China coastal and the adjacent Pacific oceans, while the dust from the Taklimakan desert moves northeastward and has a higher impact on marginal seas. The effect of dust deposition includes the stimulation of phytoplankton growth and the modification of N fixation due to the additional supply of the nutrients N, P and Fe, etc. However, the process of dust deposition and the response of the marine ecosystem to dust input are extremely complicated. If feasible, the future of ADOES will focus on cutting-edge approaches from the scope of molecular biology and experimental ecology to study primary production processes in the Western Pacific, combining satellite data and in situ measurements to estimate more precisely the deposition fluxes of bioavailable nutrients coming from dust or its mixture with anthropogenic substances.

113 Given that the lifetime of the current Working Group has exceeded four years, it was suggested that the WG be terminated. **The Sub-Commission thanked** Co-Chairs for their efforts made in the last four years to recruit Southeast Asian (SEA) scientists into this study, **and invited** Co-Chairs to consider proposing, if feasible, a new working group with a new title and new terms of reference, along with the recruitment of more scientists from the SEA region on the studies of dust from forest fires and its impacts on ocean ecosystems

5.3.2 WG002: Working Group on World Ocean Assessment

114 Dr Liang Liu, representing Dr Juying Wang from the National Marine Environmental Monitoring Centre, China, presented the activities that the Working Group had carried out during the last intersessional period. The Working Group has participated in the Regional Scientific and Technical Capacity Building Workshop on the World Ocean Assessment (the Regular Process) in Bangkok, 17–19 September 2012 to provide introduction of existing regional assessments and information gap in the South China Sea to the workshop. A website (<http://regular.process.mem.gov.cn/eng>) established for information and links to global activities of the Regular Process has been maintained well by the Working Group.

115 Dr Liu suggested the termination of this Working Group due to the difficulties in conducting its activities in the current operational mechanism of the World Ocean Assessment. However, noting the importance of strengthening the science-policy interface, it was recommended that Working Groups as such may be reestablished when deemed necessary.

5.3.3 WG003: Working Group on Mapping Harmful Jellyfishes

116 Dr Xuelei Zhang, from the First Institute of Oceanography, State Oceanic Administration, China, presented the objectives of the Working Group, aiming to motivate broad participation of relevant member countries to advance a new project to address the issue of harmful jellyfishes (HJ), both venomous and blooming giants. The current WG consists of members from China, Thailand, Malaysia, US and Australia. The serious problems of HJ in the region have been

drawing high concerns of the public since they are not only a health hazard but also leading to economic losses. However, the expertise to prepare for HJ monitoring and research is still in development and it is premature to advance to a new project on this topic. The WG requests an extension until May 2017, during which the WG shall establish a web-based mechanism for information communication, explore more partners and identify the focus and methods on the basis of current bilateral / multilateral cooperation, and then conduct a meeting to discuss and decide on follow-up activities and whether to apply for a new project on HJ. The WG's ultimate objective is to establish a sustained mechanism for cooperation in order to collect information on species and types of HJ and the environmental drivers, analyze patterns and trends of HJ, propose research and response directions, and provide expertise for jellyfish hazard management.

- 117 It was noted that there was a large gap between the expected outcomes and current status. Suggestions were made on either establishing a strategy for collecting distributional data of jellyfish or establishing a group of specialists in each collaborating country.

5.3.4 WG004: Working Group on Marine Renewable Energy Technology Development

- 118 Dr Nor Aieni Haji Mokhtar from the University of Malaysia Terengganu presented the background and activities that the Working Group has carried out during the intersessional period. Several methods for generating renewable energy were presented along with their requirements and limitations. The Working Group has held a range of workshops that covered the status and on-going efforts of Marine Renewable Energy Technology (MRET) development in the Western Pacific. Ideas from the 1st WESTPAC workshop were compiled in a report for knowledge sharing among member countries, albeit with limited circulation.

- 119 After presenting the status of MRET development in Member States including China, the Philippines, Indonesia, Japan, the Republic of Korea, Fiji, Vietnam, Australia and Malaysia, a survey was presented that identified the present state of implementation readiness regarding MRET in WESTPAC Member States. The predominant result was that the deployment of MRET was on its initial stage. The Working Group suggested this could be due to the lack of awareness of MRE as a potential energy source or the perception by governments that MRE has not yet proven viable. Therefore, for it to prove more feasible, a focus must be placed on research and development by Member States. Dr Mokhtar stressed that it is of utmost importance to continue to find sponsorship in order for stakeholders to continue working successfully.

- 120 From the concluding discussions that took place, it became clear that many Member States were willing to participate in the necessary research and development according to their specific interests. However, concerns were voiced regarding the lack of research on ecological impacts of the deployment of the necessary technology.

- 121 It was thus recommended that the Working Group be extended for another two years in consideration of interests of Member States in the study and development of marine renewable energy technology.

5.4 CAPACITY DEVELOPMENT FOR MARINE SCIENCE, OBSERVATIONS AND SERVICES

5.4.1 Development of the IOC Regional Network of Training and Research Centres

- 122 Mr Zhu briefed the session on the implementation of the self-driven, region-specific capacity building initiative, "UNESCO/IOC Regional Network of Training and Research Centres on Marine Science".

- 123 He recalled that WESTPAC initiated this programme, aiming to improve the regional capability and capacity on oceanography in a more sustainable and systematic manner, through the establishment of regional training and research centers in national oceanographic institutes or universities, and the provision of regular training and research opportunities at these regional centers, within their domains of focus, mainly to young scientists from within and outside the WESTPAC region. The initiative was adopted by the Sub-Commission at its Seven Intergovernmental Session (WESTPAC-VII, 26-29 May 2008, Sabah, Malaysia) and endorsed by the Intergovernmental Oceanographic Commission at its Forty-first session of the IOC Executive Council (IOC/EC-XLI, 24 June-1 July 2008, Paris, France).
- 124 In accordance with approved Guidelines and Procedures (Recommendation SC-WESTPAC-VII.3), the IOC Regional Training and Research Centre on Ocean Dynamics and Climate was officially established through an Agreement signed by the Intergovernmental Oceanographic Commission of UNESCO and the host institute, the First Institute of Oceanography, State Oceanic Administration (FIO, SOA) of China. Since its inauguration in 2011, the ODC Centre has been organizing regular trainings annually.
- 125 Following the launch of the ODC Centre, wide support was received from many regional countries. The level of this backing was indicated by the attendance of a wealth of delegates at the “International Feasibility Study Workshop towards the establishment of an IOC Regional Training and Research Centre (RTRC)”, (Kashiwa, Japan, 18–19 November 2014). Participants positively reacted to Japan’s efforts to establish an RTRC on coastal and marine sustainability science. Indonesia, Malaysia and Vietnam were also joining efforts to establish RTRCs based on their own scientific specialization and regional recognition. Furthermore, Japan emphasized the importance of the establishment of a RTRCs network in the region.
- 126 Mr Zhu also informed the meeting that the Agreement concerning the establishment of the ODC Centre will be renewed at this session for another six years, and an application was received from Malaysia for an IOC Regional Training and Research Centre on Harmful Algal Blooms.
- 127 Japan highlighted the importance for IOC and its WESTPAC to develop capacity of its Member States for sustainability science. Malaysia informed the meeting of its willingness to host the RTRC on harmful algal blooms.
- 128 Taking into account previous discussions under agenda item 4.4, **the Sub-Commission reviewed and adopted** the [Recommendation SC-WESTPAC-X.2](#) relating to the IOC Regional Network of Training and Research Centres on Marine Science.

5.4.2 IOC Regional Training and Research Centre on Ocean Dynamics and Climate

- 129 Dr Fangli Qiao, Director of the IOC Regional Training and Research Centre on Ocean Dynamics and Climate, presented the major activities of the Centre from the last three years including three training courses on ocean dynamics and climate models, and one international forum on the role of the oceans in multi-decadal climate variability.
- 130 The operation of the IOC Regional Training and Research Centre on Ocean Dynamics and Climate (RTRC-ODC), since its establishment in 2011, has been successfully conducted with wide support received from many countries within and outside the region. In total, 204 trainees from 28 countries have participated in training courses. Information on the operation of the center and the financial implication for the regular trainings was also provided.
- 131 **The Sub-Commission expressed** its high appreciation to Dr Fangli Qiao, his institute and the Government of China for their great contribution made to improve the regional capacity in the research of ocean dynamics, air-sea interaction, climate change, and numerical modeling,

and **further encouraged** all Member States to nominate their qualified trainees to take part in the regular training courses.

132 A ceremony took place on the morning of 14 May 2015 for the exchange of letters between the Intergovernmental Oceanographic Commission of UNESCO and the First Institute of Oceanography of State Oceanic Administration of the People's Republic of China to renew the Agreement, which was initially signed by both parties at the 8th Intergovernmental Session of the Sub-Commission (WESTPAC-VIII, Bali, Indonesia, 10–13 May 2010) regarding the Establishment of a Regional Training and Research Centre Participating in the UNESCO/IOC Regional Network of Training and Research Centres on Oceanography in the Western Pacific.

133 The letters were signed by Dr Vladimir Ryabinin as Executive Secretary IOC and Assistant Director-General of UNESCO, and Dr Fangli Qiao, Secretary General of the First Institute of Oceanography of State Oceanic Administration, China. The exchange of letters was witnessed by IOC Officers, WESTPAC Officers along with all delegates and partners at the WESTPAC-X.

5.4.3 IOC Strategic Plan for Capacity Development

134 Dr Adoté Blivi, Chair of the IOC Inter-sessional Working Group for the Development of the IOC Capacity Development Strategy), referring to the Document "IOC Capacity Development Strategy for 2015–2021".

135 He recalled that, in order to enable Member States to participate in and benefit from its programmes, IOC has been attaching great importance to capacity development since its beginning with a number of Plans of Action developed. These Plans of Action included a UNESCO/IOC Comprehensive Plan for a major assistance programme to enhance the marine science capabilities for developing countries (IOC/INF-612, 1985), IOC Training, Education and Mutual Assistance Programme (TEMA) Strategy (TEMA-V/7, 1991) and Action Plan (TEMA V/9, 1991–1995) as well as observations and experiences of TEMA implementation, 1984–1994 (IOC-XVIII/Inf.2, 1995). *IOC Criteria and Guidelines for the Transfer of Marine Technology* (IOC/INF-1203) its implementation plan (IOC/INF-1212; 2005) and IOC Principles and Strategy for Capacity-building (IOC/INF-1211, 2005), were adopted in 2003.

136 Dr Blivi introduced that the IOC Inter-sessional Working Group for the Development of IOC Capacity Development Strategic Plan was established in accordance with the Decision IOC-XXVII/Dec.5.5.1 (Development of a New Capacity Development Strategy). He explained that the draft strategy provides six outputs and numerous activities. These outputs call for investing in people and institutions, enhancing access to scientific tools and methodologies, reinforcing IOC's capabilities to provide services to Member States, enhancing the communication between scientific and policy makers communities, expanding ocean literacy in civil society and mobilizing resources to accomplish these goals. The draft strategy would be submitted for adoption to the 28th Session of the IOC Assembly (June 2015).

137 He informed the meeting that, in order to ensure the widest possible understanding of, and agreement with the strategy, it was decided that the draft documents would be presented during Sessions of the major IOC programmes as well as IOC Sub-Commissions that would meet between March and May 2015. While no further changes could be made to the documents prior to the Assembly, Member States participating in these meetings will be able to ask questions and comment.

138 **The Sub-Commission took note of** the IOC draft Strategic Plan for Capacity Development, and **further requested** Member States to provide their comments, if any, on this draft Strategy at the 28th Session of the IOC Assembly.

5.5 RECOMMENDATION OF WESTPAC ADVISORY GROUP ON THE IMPLEMENTATION OF REGIONAL PROGRAMMES, PROJECTS AND WORKING GROUPS FOR MAY 2012–MAY 2015

139 After reviewing the ongoing projects and working groups, Dr Youn-Ho Lee, Chair of the Advisory Group, reported to the Session the outcome of the work undertaken by the group. Noting tremendous achievements over the last intersessional period, the group recommended that:

- Projects be continued, including South China Sea Fluvial Sediments and Environmental Change, DNA Taxonomy and Recruitment monitoring (DRMREEF), and Marine Toxins and Seafood Safety;
- Projects or Working Group be terminated/merged to other projects: Marine Hazards to Climate Change (merged into OFS), WG on Asian Dust and its impact, and WG on World Ocean Assessment;
- Projects or Working Group be continued but with recommendation on further improvement on planning and partnership building: NEAR-GOOS; SEAGOOS (OFS, MOMSEI); Air-Sea Interaction in the Kuroshio Extension; Marine and Coastal Biodiversity and Conservation; Harmful Algal Blooms; Remote Sensing for Coastal Habitat Mapping, and WG on Marine Renewable Energy Technology Development;
- Projects or Working Group be continued but with recommendation on clarifying its objectives and narrowing its scope: Coral Reef under Climate and Anthropogenic Perturbation, and WG on Mapping Harmful Jellyfishes in Tropical Waters.

140 **The Sub-Commission recognized** the fact that challenges do arise for all projects and Working Groups, thus the evaluation process is a means to encourage all projects and Working Groups to implement their planned activities in a timely manner in order to attain the expected objectives.

141 **The Sub-Commission expressed** its appreciation to the Advisory Group and further **endorsed** the recommendations made by the Group.

6. REVIEW AND APPROVAL OF NEW PROGRAMMES/PROJECTS, AND/OR NEW WESTPAC WORKING GROUPS AND THEIR TERMS OF REFERENCE

6.1 DEVELOPMENT OF A REGIONAL PROGRAMME TO MONITOR THE ECOLOGICAL IMPACTS OF OCEAN ACIDIFICATION ON CORAL REEF ECOSYSTEMS

142 Dr Somkiat Khokiattiwong from the Phuket Marine Biological Centre, presented a proposal on the development of a regional programme to monitor the ecological impacts of ocean acidification on coral reef ecosystems. He explained that the ocean has absorbed about one third of the anthropogenic carbon dioxide (CO₂) emissions since the industrial revolution. This massive input of CO₂ is generating global changes in the chemistry of seawater, especially on the carbonate system. These changes are collectively referred to as “ocean acidification” because increased CO₂ lowers seawater pH (i.e., increases its acidity). According to geological records, this acidification is happening at rates not seen for at least 50 million years.

143 Recent studies have shown that the resulting decrease in ocean pH will make it more difficult for marine calcifying organisms, such as corals, molluscs, and calcareous plankton, to form biogenic calcium carbonate, and existing calcium carbonate structures will become vulnerable to dissolution. Thus, ongoing acidification of the oceans poses a threat to ocean-based security.

144 Given the socio-economic dependence of most Southeast Asian coastal communities upon coral reef ecosystems, and limited knowledge on the ecosystem responses to ocean

acidification, he stressed the critical need for WESTPAC to coordinate and develop more ocean acidification research and long-term monitoring with a view to enhancing knowledge and develop meaningful projections on future impacts of ocean acidification on marine ecosystem in the region.

145 He further introduced that the WESTPAC Workshop on Research and Monitoring of the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems (Phuket, Thailand, 19–21 January 2015) attracted wide support from scientific communities in the region to develop a joint long-term monitoring programme/network on the impacts of ocean acidification on coral reefs across the region. Several pilot sites were selected as a starting point for developing the regional monitoring programme/network. A table for monitoring capacity analysis was developed and this will be distributed to participants willing to join the programme development, with a view to analyzing the current monitoring capacity; identifying common monitoring methods; and capturing input into the development of a consistent, comparable and cost-effective “Standard Operating Procedure (SOP)” for all pilot sites.

146 Wide support was received from Member States for this project proposal given limited knowledge on ocean acidification and its impacts. **The Sub-Commission expressed its great appreciation** to the Global Ocean Acidification Observing Network (GOA-OA) and NOAA for their technical assistance provided in the development of the regional workshop, and **further expected** that such technical assistance could continue.

6.2 REGIONAL STUDY OF MARINE ENDANGERED SPECIES (MAMMALS AND SEA TURTLES) IN TROPICAL ASIA FOR EFFECTIVE CONSERVATION (MESTA)

147 Dr Xuelel Zhang from the First Institute of Oceanography, China introduced the proposal on the regional study of marine endangered species (mammals and sea turtles) in tropical Asia for effective conservation. Given that the region is home to approximately forty of the global total of eighty-six cetacean species, and that many species have become endangered largely due to anthropogenic pressure, the project was jointly proposed by the First Institute of Oceanography (FIO), State Oceanic Administration of China; Phuket Marine Biological Center (PMBC), Thailand; and the Institute of Oceanography & Environment, Universiti Malaysia Terengganu (INOS-UMT) with the objectives to establish long term and regular regional collaborative mechanism for relevant research on marine endangered species in tropical Asia.

148 Dr Zhang explained that, with the Irrawaddy dolphin identified as a research focus in the first phase (2015–2017), traditional methods and modern science and technologies will be applied to study the dolphin’s habitats, population size and its main threats.

149 Support was expressed for this project proposal in terms of the need for more scientific information, research capacity building and effective protection for marine endangered species.

6.3 UPWELLING STUDIES THROUGH OCEAN DATA INTEGRATION TOWARDS SUSTAINING OCEAN HEALTH AND PRODUCTIVITY

150 Dr Mohd Fadzil Mohd Akhir, Universiti Malaysia Terengganu, highlighted the importance of upwelling to ocean ecosystem as it brings nutrient rich water to the surface, leading to increased levels of ocean productivity. During monsoon seasons, several sites become upwelling zones due to the unique physical settings of the South China Sea and its surrounding seas. While there are several well-established upwelling areas, i.e. Hainan Island and Vietnam coast, there are a few upwelling areas within the South China Sea (SCS) that have been recently discovered and that had never been studied before. Amongst them are the region along the east coast of peninsular Malaysia and an area south of Java. There are many other sites that are believed to have similar upwelling dynamics that either have not yet been discovered or are not well explored.

151 The main objectives of this project are to: (i) explore new upwelling sites and increase the understanding of physical-biological interaction dynamics of upwelling region in the SCS and surrounding seas through comparative studies; (ii) plan integrated data gathering that involve field data, satellite data and numerical model in understanding upwelling dynamics; and (iii) disseminate scientific information on upwelling for establishment of better management planning tool for marine environment and fisheries.

152 This proposal was welcomed with recognition of the importance of upwelling systems to ocean productivity, suggestions were made on the possible inclusion of socio-economic aspects, comparison with upwelling areas in other regions, and cooperation with CLIVAR and IMBER.

6.4 INDO-PACIFIC OCEAN ENVIRONMENTAL VARIATION AND AIR-SEA INTERACTION

153 Dr Fangli Qiao from the First Institute of Oceanography, China, introduced the proposal on Indo-Pacific Ocean Environment Variation and Air-sea Interaction (IPOVAI) for a period of six years. In view of the role of air-sea interaction in shaping weather and climate and the low prediction ability for monsoon onset and typhoon intensity, the proposed project, with a focus on monsoon system and tropical cyclones, will intensify studies on air-sea interaction, its related mechanism in the Indo-Pacific, and its impact on large-scale oceanographic and atmospheric circulations.

154 He stressed the objectives of this project to: (i) improve the scientific understanding on the role of surface wave in air-sea interaction in the Indo-Pacific and develop new parameterization on air-sea fluxes especially for high wind conditions; (ii) explore new findings on air-sea interaction through in-situ observations; and (iii) improve the prediction of typhoon intensity and Asian monsoon, based on up-to-date ocean and climate numerical models. Expected outcomes include: advanced understanding on the dynamics of the Indian Ocean and Pacific Ocean and the mechanism of air-sea interaction over the Indo-Pacific area, especially the role of surface waves in air-sea fluxes; joint scientific publications with collaborative research networks; updated methodology for typhoon and monsoon prediction; and most importantly, the provision of air-sea coupled models on Asian monsoon and typhoon.

155 Dr Qiao further clarified the difference of this project from MOMSEI and OFS projects. IPOVAI will develop an air-sea coupled prediction system with new scientific understandings on air-sea interaction while MOMSEI focuses on observations for monsoon onset process and OFS endeavors to set up a 3-day ocean forecasting system. Both MOMSEI and OFS can support the implementation of IPOVAI through the sharing of data and scientific understanding on monsoon onset, and the development of wave-tide-circulation coupled ocean model.

156 This proposal was well received at the session in terms of the significant scientific research on air-sea interaction. Considering the low prediction ability for monsoon onset and typhoon intensity, this project could provide valuable data input to enhance existing climate models that can benefit communities who are affected by monsoon perturbations.

6.5 DEVELOPMENT OF THE INDO-PACIFIC OCEAN OBSERVATIONS AND SERVICES NETWORK (IPON)

157 Dr Yutaka Michida, the University of Tokyo, presented a concept paper regarding the establishment of a Scientific Steering Committee for the Indo-Pacific Ocean Observation Network (SC-IPON) by recalling the outcomes of the WESTPAC Research Directors' Forum that was organized in conjunction with the 9th WESTPAC International Scientific Symposium (Nha Trang, Vietnam, 22–25 April 2014).

158 Over 40 Directors, representatives and regional experts from marine scientific institutes, academic faculties and/or operational agencies in the Indo-Pacific met at the Forum, aiming to

build and enhance networks; exchange strategic directions of their institutions; identify scientific and technical challenges; and spark regional actions in the framework of IOC for future collaborations by exploring any opportunity of synergizing existing and planned observations.

159 The Forum recognized that, mainly due to the lack of integrated multi-disciplinary research and adequate sustained observations in a seamless manner from the local to basin scale, it is essential to foster cooperation among marine scientific institutes, academic faculties, and/or national operational agencies in the Indo-Pacific, and promote broad campaigns with a goal of consolidating our scientific understanding on the critical oceanic processes from the coast to open ocean, from tropics to high-latitude areas, and on the ocean's interaction with atmosphere and solid Earth.

160 The Forum culminated in the adoption of a Joint Directors' Statement towards the attainment of the future we want: "A Healthy and Safe Ocean for Prosperity in the Indo-Pacific Region", calling for: urgent action to establish the Indo-Pacific Ocean Observations and Services Network (IPON); creation of a Scientific Steering Committee for the Indo-Pacific Ocean Observations and Services Network (SC-IPON) as an arm to guide the development of IPON; and heightened recognition from IOC/UNESCO Member States, regional leadership and policy decision-makers on the need to establish IPON.

161 This proposal prompted extensive discussion with regard to the nature and future development of IPON, and the establishment of SC-IPON and its membership. Despite high recognition on the importance of IPON, **the Sub-Commission noted** that the establishment of SC-IPON and its future operation would pose significant challenges without adequate secretariat support. **The Sub-Commission decided** to set up an open-ended Intersessional Task Force towards the establishment of SC-IPON, under the leadership of Dr Michida (Japan) with participation of nominated experts from China, Vietnam and other interested Member States, and with a mandate to identify options for providing secretariat support for the establishment and operation of SC-IPON. **The Sub-Commission recommended** the open-ended Intersessional Task Force meet during the 28th Session of the IOC Assembly, June 2015, in Paris.

162 After four new project proposals and one proposal for the establishment on SC-IPON were presented, Dr Vo Si Tuan, on behalf of the WESTPAC Advisory Group, briefed the meeting on the review process of the Group on new project proposals in accordance with the framework established in the WESTPAC Strategy and Programme Structure, and the Guideline for the Establishment of WESTPAC Working Groups. The WESTPAC Advisory Group reviewed all new proposals received on 1–3 December 2014, with recommendations made on each proposal. Based on these recommendations, those proposals were further revised and submitted to this Session for approval.

163 While appreciating the tremendous work of the WESTPAC Advisory Group in the evaluation of the new proposals, **the Sub-Commission reviewed** all revised proposals, and **further decided** to establish the four new projects.

164 **The Sub-Commission reviewed and adopted** Recommendation SC-WESTPAC-X.3 on the establishment of a Scientific Steering Committee for the Indo-Pacific Ocean Observations and Services Network (SC-IPON) with its Terms of Reference annexed to this Recommendation.

7. COOPERATION WITH OTHER ORGANIZATIONS

UNEP Northwest Pacific Action Plan (NOWPAP)

165 Mr Xiaodong Zhong, Deputy Coordinator for the UNEP Northwest Pacific Action Plan (NOWPAP), highlighted the close partnership over the last ten years between NOWPAP and

WESTPAC in view of common goals to promote international cooperation, information exchange and capacity building for marine environmental protection.

- 166 Mr Zhong further suggested the following areas of cooperation could be established over the next intersessional period, which included the establishment of a link between WESTPAC's NEAR-GOOS databases and NOWPAP's CEARAC and DINRAC; and the conduct of joint workshops and/or trainings on endangered marine and coastal species, ocean remote sensing for coastal habitat mapping, World Ocean Assessment, Integrated Coastal Management, and setting Ecological Quality Objectives. Moreover, joint activities could be also developed to address the common concerns over marine litter and nutrients, climate change impacts on marine and coastal ecosystems, and public awareness.

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)

- 167 Mr Yinfeng Guo, PEMSEA Resources Facility, introduced that PEMSEA is the coordinating mechanism for the implementation of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), a regional strategy adopted by 12 countries in the region in 2003. 12 Non-Country Partners, including WESTPAC, signed the Partnership Operating Arrangements for the Implementation of the SDS-SEA,

- 168 He reaffirmed the commitment of PEMSEA to collaborate with WESTPAC in applying science to achieve the objectives of the Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), and in strengthening the capacity of PEMSEA's Regional Centres of Excellence (RCOE) and ICM Learning Centres (LCs) in the delivery of scientific and technical services to ICM demonstration and replication sites across the East Asian Seas (EAS) region. He pointed out several issues to be addressed with regard to scaling up the implementation of the SDS-SEA over the next five years, which include: harmful jellyfishes, coastal and marine biodiversity and conservation, marine renewable energy technology development, monitoring of ecological impacts of ocean acidification on coral reef ecosystems, coral reef restoration techniques, and harmful algal blooms.

- 169 To materialize the proposed areas of cooperation, he suggested that WESTPAC participate in the development of and adopt the updated SDS-SEA and corresponding SDS-SEA Implementation Plan at the EAS Congress 2015. Other suggested cooperation included periodic sharing of information on events, programme progress and research findings; identification of pilot sites for establishing and operationalizing monitoring systems in support of state of coast reporting practiced at ICM sites; engaging PEMSEA Regional Centres of Excellence and/or ICM Learning Centres in the IOC Regional Network of Training and Research Centres to strengthen the networking and experience sharing; conducting joint training courses; and developing training manuals and toolkits.

FAO/Bay of Bengal Large Marine Ecosystem Project (BOBLME)

- 170 Dr Chris O' Brien, Regional Coordinator for BOBLME, reported to the Session that, by sharing common interests in promoting international collaboration and promoting an ecosystem-based approach to management of the ocean and fisheries, collaboration has been well established over the last five years between the BOBLME Project and WESTPAC, mainly in area of capacity development, in particular, through the SEAGOOS Pilot Project on Monsoon Onset Monitoring and its Social & Ecosystem Impacts (MOMSEI).

- 171 While stressing the importance of good knowledge and understanding of large-scale processes and dynamics affecting the Bay of Bengal to ensure a healthy ecosystem and sustainable use of marine living resources for the benefit of the people, he envisaged that, during the implementation of the BOBLME Strategic Action Programme in the second phase of the BOBLME Project, the collaboration with WESTPAC will continue to develop, in particular, in areas of ecosystem health, climate change, and oceanography, with a focus on continued

capacity development, knowledge management, information exchange and institutional strengthening.

World Climate Research Program/Climate Variability and Predictability (WCRP/CLIVAR)

172 Ms Valery Detemmerman informed the meeting that CLIVAR is a core project of the World Climate Research Programme (WCRP) with mission to understand the dynamics, the interaction, and the predictability of the coupled ocean-atmosphere system. CLIVAR facilitates observations, analysis and predictions of changes in the Earth's climate system, enabling better understanding of climate variability and dynamics, predictability, and change, to the benefit of society and the environment in which we live.

173 Since the WCRP is intending to enhance its regional presence, there is a lot of potential for working together with Member States in the Western Pacific region especially since they are looking for a more integrated approach to respond to certain scientific problems such as monsoon predictability. WCRP is developing a multi-year strategy that will include the organization of workshops and symposia organized with regional institutes to attract and involve regional scientists. In closing, Ms Detemmerman announced that a conference would take place in September 2016 with a large focus on the physical climate system.

174 **The Sub-Commission recognized** that the cooperation with CLIVAR would bring added value to WESTPAC programmes, and **further encouraged** the WESTPAC Office to continuously explore any possibilities to establish substantive partnership with CLIVAR.

175 **The Sub-Commission noted** with appreciation the efforts made by the WESTPAC Office, projects and working groups to establish and/or strengthen its cooperation with other international organizations and programmes, and **further encouraged** the establishment of more concrete cooperation.

IOC Sub-Commission for Africa and Adjacent Island States (IOCAFRICA)

176 Dr Monde Mayekiso, Chair of the IOC Sub-Commission for Africa and Adjacent Island States (IOCAFRICA), congratulated WESTPAC on the remarkable achievement made over past three years, and hoped that WESTPAC could serve as a model for IOCAFRICA. In closing, he expected to continue the collaboration with and draw upon experience of WESTPAC, particularly in involving governments and garnering their support.

8. WESTPAC PROGRAMME AND BUDGET FOR MAY 2015–MAY 2017

177 Mr Zhu presented the Draft WESTPAC Programme and Budget for May 2015–May 2017, referring to the Document IOC/SC-WESTPAC-X/16. This draft budget was prepared based on the input from projects and working groups and discussions pertaining to the respective agenda items at the present session, serving as guidance on activities that the Sub-Commission would like to jointly promote and seek funding from various sources in support of their implementation. Mr Zhu also informed Member States that in accordance with the new estimates of the IOC regular budget for 2016–2017, as represented in the documentation for the 28th Session of the IOC Assembly, approximately US\$ 115 K would be available for WESTPAC activities for May 2015–May 2017. This means that most of the WESTPAC activities for the next intersessional period will have to be supported from extrabudgetary resources

178 **The Sub-Commission noted with appreciation** the efforts made by the WESTPAC Office particularly in resource mobilization since the last session of the Sub-Commission and the preparation of the draft work plan and budget for May 2015–May 2017. **The Sub-Commission requested** all Member States to provide and elevate their support in all possible ways.

179 **The Sub-Commission adopted** [Recommendation SC-WESTPAC-X.4](#) concerning WESTPAC Programme and Budget for May 2015–May 2017.

9. ADMINISTRATION AND MANAGEMENT

9.1 ELECTIONS OF THE OFFICERS OF THE SUB-COMMISSION

180 Upon the request of the Chair of the Nomination Committee, Mr Wenxi Zhu presented the recommendations of the Committee. According to the relevant IOC Rules of Procedure, the Chairperson and the Vice-chairpersons of the Sub-Commission shall be elected at this session. Once elected, they shall not remain in his/her mandate more than two successive terms. The present WESTPAC Officers were elected at the last WESTPAC Session with Dr Khokiattiwong from Thailand serving as Chair, Dr Yoon-Ho Lee from the Republic of Korea as the first Vice-chair and Dr Vo Si Tuan from Vietnam as the second Vice-chair.

181 Mr Zhu informed the meeting that Dr Khokiattiwong was nominated for the post of Chairperson. The nomination was seconded by the delegates from China and Vietnam. Dr Yoon-Ho Lee was nominated as the First Vice-chair, seconded by Indonesia and Vietnam, with primary responsibility to oversee the Advisory Group. Dr Vo Si Tuan was nominated to serve as the Second Vice-chair, with primary responsibility for the organization of the WESTPAC International Scientific Symposium. The nomination was seconded by the Republic of Korea and the Russian Federation.

182 The proposed nominations were unanimously supported by the Sub-Commission, and the three officers were duly elected by acclamation for their second term.

9.2 WESTPAC MEMBERSHIP AND PARTNERSHIP

183 The IOC Executive Secretary informed the meeting that an official letter was received from Bangladesh concerning its willingness to join WESTPAC. The membership of Bangladesh for WESTPAC took effective immediately upon the acknowledgement of the receipt of its notification.

184 **The Sub-Commission warmly welcomed** Bangladesh as its 22nd Member State. The delegation of Bangladesh stated that joining WESTPAC would be of great help to advance their knowledge on its coasts and ocean, and to further underpin the development of the blue economy.

185 **The Sub-Commission highlighted** the need for building partnerships with other regional and global organizations/programmes in order to achieve all parties' common goals with limited resources.

9.3 RESOURCES MOBILIZATION

186 Given the extremely limited resources from IOC, Mr Zhu explained that WESTPAC Sessions provide good opportunities to identify common interests and possible financial sources within Member States. Tremendous fund-raising efforts have been made over the last intersessional period with relevant agencies and Member States.

187 **The Sub-Commission urged** all Member States to provide or augment their support, either in-cash or in-kind, in the development and implementation of a wide range of WESTPAC activities.

10. DATE AND PLACE OF THE NEXT SESSION

188 The Delegation of China offered to host the next session in conjunction with the 10th WESTPAC International Scientific Symposium, Qingdao 2017, subject to formal confirmation by the Government of China.

189 **The Sub-Commission accepted with appreciation** the offer by the Government of China to host the Eleventh Session in Qingdao, 2017, subject to the final endorsement by the relevant authorities.

190 In view of the above, **the Sub-Commission adopted** the [Recommendation SC-WESTPAC-X.5](#) on the date and place of the next session.

11. OTHER MATTERS

191 Mr Zhu informed the meeting that WESTPAC is to publish a book in commemoration of its 25th Anniversary with Dr Yasuwo Fukuyo from Japan and Dr Hyung Tack Huh from the Republic of Korea as co-editors. The book attempts to draw on the experience and insights of some 30 invited experts, who had or have been endeavouring to promote marine science development and cooperation in the pre-establishment and present development of WESTPAC, to examine the essential role of marine science in ocean governance, and to demonstrate the great importance of regional cooperation to the sustainability of marine and coastal resources.

192 Dr Fukuyo briefed the meeting on the preliminary table of contents with potential authors. He further requested all Member States to assist in the collection of stories and photographs of collaborative activities so that it could be published by the end of 2015.

193 **The Sub-Commission expressed** its sincere thanks to Co-editors and the WESTPAC Office for their great efforts in the preparations, coordinating and development of this important publication. Japan and the Republic of Korea expressed their kind offers to provide financial support for this publication.

12. ADOPTION OF SUMMARY REPORT AND RECOMMENDATIONS

194 Dr Yutaka Michida, Chairperson of the Recommendation Committee, reported to the plenary that the Committee convened two meetings on 14 May 2015 with active participation of Member States, and decided to submit five draft recommendations for consideration by the Sub-Commission.

195 Dr Somkiat Khokiattiwong called on the delegates to review the draft recommendations and the draft summary report paragraph by paragraph, taking into account the substantial comments made during the session.

196 **The Sub-Commission adopted** the Summary Report and the Recommendations contained therein, which incorporated the amendments accepted by the Sub-Commission.

13. CLOSURE

197 **The Sub-Commission expressed its gratitude** once again to the Local Organizing Committee for its excellent arrangements and hospitality, and to all delegates and participants for their cooperation and efforts to make the meeting a success. **The Sub-Commission extended its high appreciation** to WESTPAC Officers, WESTPAC Advisory Group for their valuable guidance provided over past four years.

- 198 **The Sub-Commission highlighted** the recent remarkable achievement made by WESTPAC in the development, coordination and promotion of marine scientific research, observations and capacity building. The dynamic efforts of the WESTPAC Office for resources mobilization, programme development and their passion to serve WESTPAC's interests are considered among key factors behind WESTPAC's recent achievement.
- 199 **The Sub-Commission expected** that the momentum of WESTPAC should be long kept; the cordial atmosphere and effective working relationship between the present WESTPAC Office and Member States should be maintained; and the quality service provided by the WESTPAC Office should be reinforced.
- 200 Dr Somkiat Khokiattiwong, Chairperson, declared the Session closed at 16:30 on 15 May 2015.

ANNEX I

AGENDA

- 1. OPENING**
- 2. ORGANIZATION OF THE SESSION**
 - 2.1 ADOPTION OF THE AGENDA
 - 2.2 DESIGNATION OF RAPPORTEUR FOR THE SESSION
 - 2.3 CONDUCT OF THE SESSION
- 3. STATUTORY REPORTS**
 - 3.1 STATEMENT OF THE CHAIRPERSON
 - 3.2 REPORT BY HEAD OF THE WESTPAC OFFICE ON INTERSESSIONAL ACTIVITIES AND BUDGET OVERVIEW, INCLUDING THE OPERATION OF THE WESTPAC OFFICE
 - 3.3 RECENT DEVELOPMENTS WITHIN IOC/UNESCO, AND ITS RELEVANCE TO WESTPAC
- 4. STRATEGIC DEVELOPMENT**
 - 4.1 TWENTY-FIFTH ANNIVERSARY OF THE SUB-COMMISSION
 - 4.2 RECOMMENDATIONS FROM THE NINTH WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM 2014, NHA TRANG, VIETNAM
 - 4.3 PREPARATIONS FOR THE TENTH WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM 2017, QINGDAO, CHINA
 - 4.4 WESTPAC APPROACH TO CAPACITY DEVELOPMENT
- 5. REVIEW AND EVALUATION OF REGIONAL PROGRAMMES, PROJECTS AND WORKING GROUPS FOR MAY 2012 - MAY 2015**
 - 5.1 OCEAN PROCESSES AND CLIMATE IN THE INDO-PACIFIC
 - 5.1.1 North East Asian Regional-GOOS**
 - 5.1.2 South East Asian Regional- GOOS, Including Ocean Forecasting Demonstration System (OFS), and Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI)**
 - 5.1.3 Response of Marine Hazards to Climate Change**
 - 5.1.4 Air-Sea Interaction in the Kuroshio Extension and its Climate Impact**
 - 5.1.5 South China Sea Fluvial Sediments and Environmental Change**
 - 5.2 MARINE BIODIVERSITY, HEALTHY ECOSYSTEMS, SEAFOOD SECURITY AND SAFETY
 - 5.2.1 Marine & Coastal Biodiversity and Conservation**
 - 5.2.2 Coral Reef under Climate and Anthropogenic Perturbations**
 - 5.2.3 DNA Taxonomy and Recruitment Monitoring of the Coral Reef Marine Organisms**

- 5.2.4 Marine Toxins and Seafood Safety**
 - 5.2.5 Harmful Algal Blooms**
 - 5.2.6 Ocean Remote Sensing for Coastal Habitat Mapping**
 - 5.3 ENHANCED KNOWLEDGE OF EMERGING OCEAN SCIENCE ISSUES
 - 5.3.1 WG 001: Working Group on Asian Dust and its Impact on Ocean Ecosystems**
 - 5.3.2 WG 002: Working Group on World Ocean Assessment**
 - 5.3.3 WG 003: Working Group on Mapping Harmful Jellyfishes**
 - 5.3.4 WG 004: Working Group on Marine Renewable Energy Technology Development**
 - 5.4 CAPACITY DEVELOPMENT FOR MARINE SCIENCE, OBSERVATIONS AND SERVICES
 - 5.4.1 Development of the IOC Regional Network of Training and Research Centers**
 - 5.4.2 IOC Regional Training and Research Centre on Ocean Dynamics and Climate**
 - 5.4.3 IOC Strategic Plan for Capacity Development**
 - 5.5 RECOMMENDATION OF WESTPAC ADVISORY GROUP ON THE IMPLEMENTATION OF REGIONAL PROGRAMMES, PROJECTS AND WORKING GROUPS FOR MAY 2012 - MAY 2015
- 6. REVIEW AND APPROVAL OF NEW PROGRAMME/PROJECT PROPOSALS, AND/OR NEW WESTPAC WORKING GROUPS AND THEIR TERMS OF REFERENCE**
 - 6.1 DEVELOPMENT OF A REGIONAL PROGRAM TO MONITOR THE ECOLOGICAL IMPACTS OF OCEAN ACIDIFICATION ON CORAL REEF ECOSYSTEMS
 - 6.2 REGIONAL STUDY OF MARINE ENDANGERED SPECIES (MAMMALS AND SEA TURTLES) IN TROPICAL ASIA FOR EFFECTIVE CONSERVATION (MESTA)
 - 6.3 UPWELLING STUDIES THROUGH OCEAN DATA INTEGRATION TOWARDS SUSTAINING OCEAN HEALTH AND PRODUCTIVITY
 - 6.4 INDO-PACIFIC OCEAN ENVIRONMENTAL VARIATION AND AIR-SEA INTERACTION
 - 6.5 DEVELOPMENT OF THE INDO-PACIFIC OCEAN OBSERVATIONS AND SERVICES NETWORK (IPON)
- 7. COOPERATION WITH OTHER ORGANIZATIONS**
- 8. WESTPAC PROGRAMME AND BUDGET FOR MAY 2015 - MAY 2017**
- 9. ADMINISTRATION AND MANAGEMENT**

- 9.1 ELECTIONS OF THE OFFICERS OF THE SUB-COMMISSION
- 9.2 WESTPAC MEMBERSHIP AND PARTNERSHIP
- 9.3 RESOURCES MOBILIZATION
- 10. DATE AND PLACE OF THE NEXT SESSION**
- 11. OTHER MATTERS**
- 12. ADOPTION OF DECISIONS, RECOMMENDATIONS AND SUMMARY REPORT**
- 13. CLOSURE**

ANNEX II

LIST OF ADOPTED RECOMMENDATIONS

<u>Recommendation SC-WESTPAC-X.1</u>	WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM
<u>Recommendation SC-WESTPAC-X.2</u>	UNESCO/IOC REGIONAL NETWORK OF TRAINING AND RESEARCH CENTERS ON MARINE SCIENCE IN THE WESTERN PACIFIC
<u>Recommendation SC-WESTPAC-X.3</u>	ESTABLISHMENT OF A SCIENTIFIC STEERING COMMITTEE ON THE DEVELOPMENT OF THE INDO-PACIFIC OCEAN OBSERVATIONS AND SERVICES NETWORK (SC-IPON)
<u>Recommendation SC-WESTPAC-X.4</u>	WESTPAC PROGRAMME AND BUDGET FOR MAY 2015–MAY 2017
<u>Recommendation SC-WESTPAC-X.5</u>	DATE AND PLACE OF THE NEXT SESSION

Recommendation SC-WESTPAC-X.1

WESTPAC INTERNATIONAL SCIENTIFIC SYMPOSIUM

The IOC Sub-Commission for the Western Pacific (WESTPAC),

Recalling the decision of its First Session in 1990 that a major multi-disciplinary symposium should become a principal intersessional activity of WESTPAC,

Further recalling that the WESTPAC International Scientific Symposium is the only scientific series to enhance exchange of marine scientific knowledge in the region,

Having reviewed the outputs and results of the previous symposia, particularly the Ninth WESTPAC International Scientific Symposium entitled “A healthy ocean for prosperity in the Western Pacific: scientific challenges and possible solutions”, held in Nha Trang, Socialist Republic of Vietnam, 22–25 April 2014,

Expressing its great appreciation to the Government of the Socialist Republic of Vietnam, through its Vietnam Academy of Science and Technology (VAST), for having hosted the Symposium, and its Institute of Oceanography, and the National IOC Committee for Vietnam for having co-organized the Symposium,

Having formulated the WESTPAC Programme and Budget for May 2015–May 2017,

Bearing in mind the need for presentation and exchange of scientific results in an interdisciplinary forum,

Appreciates the generous offer of the Government of the People’s Republic of China to host the Tenth WESTPAC International Scientific Symposium in 2017 in Qingdao;

Decides to establish an international scientific steering committee to provide guidance in the formulation of the Symposium Themes, Sub-Themes, and Programme, including the scope, contents and structure;

Recommends that pertinent regional and international organizations be invited to support and participate in the Symposium;

Encourages all Member States and related international organizations for active participation and contribution to ensure the success of the Symposium.

Recommendation SC-WESTPAC-X.2

**UNESCO/IOC REGIONAL NETWORK OF
TRAINING AND RESEARCH CENTRES ON MARINE SCIENCE
IN THE WESTERN PACIFIC**

The IOC Sub-Commission for the Western Pacific (WESTPAC),

Recognizing the urgent need of Member States for high quality training in specialized fields of marine science in the WESTPAC region,

Bearing in mind the IOC Principles and Strategy for Capacity Building adopted at the Twenty-third Session of IOC Assembly in 2005,

Recalling that the self-driven and sustainable regional capacity building initiative titled “UNESCO/IOC Regional Network of Training and Research Centres on Marine Science”, together with corresponding guidelines and procedures were adopted by the WESTPAC at the Seventh Intergovernmental Session (WESTPAC-VII, Sabah, Malaysia, 26–29 May 2008) and subsequently endorsed by the IOC at the Forty-first Session of its Executive Council (IOC/EC-XLI, Paris, France, 24 June-1 July 2008), and that the regional network will be formed through the establishment of regional training and research centers within the national oceanographic institutes or universities of WESTPAC Member States that are willing to provide regular training and research opportunities to the trainees from all WESTPAC Member States on a free-of-charge basis,

Expressing its great appreciation to the First Institute of Oceanography (FIO) of the State Oceanic Administration of China for hosting the Regional Training and Research Centre on Ocean Dynamics and Climate (RTRC-ODC) and having organized four regional training courses at the RTRC-ODC Center during 2011–2014 on ocean dynamics, air-sea interaction and numerical modelling with a great success as demonstrated by the ever-increasing number of applicants from a growing geographical coverage,

Acknowledging the renewed commitment of FIO and the Government of the People’s Republic of China to the Regional Training and Research Centre on Ocean Dynamics and Climate (RTRC-ODC) for the period of 2015–2020,

Further acknowledging the willingness expressed by, and positive response received from Indonesia, Malaysia, Republic of Korea, Vietnam and Thailand to contribute to the network through the establishment of IOC Regional Training and Research Centres on their areas of expertise,

Invites Member States to encourage their respective national oceanographic institutes, and universities to actively participate in the Regional Network;

Requests the Executive Secretary of IOC to follow-up those Member States’ initiatives and take necessary actions to further promote this regional capacity building activity.

Recommendation SC-WESTPAC-X.3

ESTABLISHMENT OF A SCIENTIFIC STEERING COMMITTEE ON THE DEVELOPMENT OF THE INDO-PACIFIC OCEAN OBSERVATIONS AND SERVICES NETWORK (SC-IPON)

The IOC Sub-Commission for the Western Pacific (WESTPAC),

Noting the importance of the Western Pacific and adjacent regions in the global ocean and climate change,

Noting further a series of region-wide meetings after WESTPAC-IX (Busan, Republic of Korea, 9–12 May 2012) to deepen the concept of the Indo-Pacific Ocean Observations and Services Network (IPON), including the Indo-Pacific Ocean Forum (Bangkok, Thailand, 26–28 November 2013), the 9th WESTPAC International Scientific Symposium and the WESTPAC Research Directors Forum (Nha Trang, Vietnam, 22–25 April 2014), and the WESTPAC Advisory Group meeting 2014 (Phuket, Thailand, 1–3 December 2014),

Acknowledging the active participation of competent government agencies and scientific institutions in these meetings both from WESTPAC Member and non-Member States,

Acknowledging also with deep appreciation the Government of the Republic of Korea, Government of the Socialist Republic of Vietnam, and Government of Thailand for supporting these meetings,

Taking fully into account the revitalized WESTPAC activities over the last decade,

Having considered the Concept Paper proposing a new WESTPAC initiative ‘Indo-Pacific Ocean Observations and Services Network (IPON)’, which is attached as Annex I to this Recommendation,

Decides to establish a Scientific Steering Committee on the Development of the Indo-Pacific Ocean Observations and Services Network (SC-IPON) with the Terms of Reference attached as Annex II to this Recommendation;

Encourages the institutions of marine sciences and services in the WESTPAC region to:

- (i) nominate expert(s) as candidate(s) for the membership of SC-IPON in close consultation with relevant national focal point to WESTPAC;
- (ii) actively participate in this initiative; and
- (iii) provide financial and in kind support to the development of this initiative, and the establishment and operation of SC-IPON;

Requests the Executive Secretary of IOC and the WESTPAC Office to facilitate the promotion of this initiative.

Annex I to Recommendation SC-WESTPAC-X.3

**A Concept Paper
on the Indo-Pacific Ocean Observations and Services Network (IPON)**

Preamble

The Indo-Pacific region spans over both the largest monsoon domain and the largest trade wind domain of tropical latitudes, being universally recognized as a major driver of the global climate system and helps shape the regional climate.

The Indo-Pacific region hosts the highest concentration of marine biodiversity and endemism in the world, serving as the epicenter of marine life abundance and diversity on the planet with more than 75% of all known coral species, 50% of the world's coral reefs, 3,000 fish species and a greater extent of mangrove forests than any other region in the world.

Moreover, the Indo-Pacific region is home to close to half the world's population, possessing vast social and economic importance with over 70% of its total population living in and relying economically on these coastal areas. The rapid coastal population growth and economic development are threatening the region's rich yet limited marine and coastal resources as a result of unsustainable fishing practices, discharge of marine pollutants, drifting marine debris, and others. Moreover, the global climate change such as extreme weather events, rising sea levels, and ocean acidification further load challenges on sustaining human life and ocean ecosystems. The Indo-Pacific region is one of the most seismically active zones of the earth with frequent volcanic eruptions and earthquakes. Some undersea earthquakes and volcanic eruptions could trigger tsunamis and other associated disasters, resulting in massive loss of human lives and properties.

Despite tremendous efforts made over the last decades, our knowledge about the Indo-Pacific Ocean, its biodiversity, and its role in climate change and variability still remains low mainly due to the lack of integrated multi-disciplinary research, and adequate sustained observations in a seamless manner from the local to basin scale. It is essential to foster cooperation among marine scientific institutes, academic faculties, and/or national operational agencies, and hence to promote broad campaign with target of consolidating our scientific understanding of the critical oceanic processes from the coast to open ocean, from tropics to high-latitude areas, and the ocean's interaction with atmosphere and solid earth.

Purpose of this concept paper

With a view to furthering sustained observations for improved services to the Indo-Pacific societies, and on the occasion of the 25th Anniversary of the IOC Sub-Commission for the Western Pacific (WESTPAC), the Sub-Commission would like to call for marine scientific institutes, academic faculties, and/or operational agencies in the Indo-Pacific region to build and enhance networks, exchange their strategic directions, identify scientific and technical challenges, and spark regional actions in the framework of IOC for future collaboration by exploring any opportunity of synergizing existing and planned observations through the emerging Indo-Pacific Ocean Observation Network (IPON), and considering the feasibility of establishing an appropriate scientific mechanism, i.e. Scientific Steering Committee, to further propel the development of the Network (SC-IPON).

This collaboration may take place in the concerted context of both global programs [Global Ocean Observing System (GOOS), IOC International Oceanographic Data and Information Exchange (IODE), and Joint IOC-WMO Technical Commission for Oceanography and Marine Meteorology (JCOMM)], GEO task for Ocean and Society] and regional programs [GOOS

Regional Alliances (NEAR-GOOS¹, SEAGOOS², IOGOOS³, etc), TPOS⁴ (TAO-TRITON⁵ Buoy Arrays), IndoOOS⁶ (RAMA⁷ Buoy Arrays), NPOCE⁸, GAIA⁹, POSEIDON¹⁰, ITF¹¹, IOTWS¹² and others].

Proposed Vision for the Indo-Pacific Ocean Observations and Services Network (IPON)

The vision for IPON is to realize a future wherein decisions and actions for the benefit of the Indo-Pacific region are achieved by coordinated, concerted, comprehensive and sustained observations, and services including data and information, forecasting, etc.

Expected Impacts of IPON

- Recognition by governmental decision-makers of the value of sustained observations and services;
- Development of a shared knowledge base, including scientific and technical publications, technical manuals, standards, and publicity materials;
- Improvement of climate prediction and ocean forecast capabilities;
- Strengthened and enhanced inter-basin cooperation, particularly in the Indo-Pacific region;
- Ship-time sharing among research institutes;
- Transfer of technology and knowledge and data sharing through capacity development activities; and,
- Development of younger generation of science leaders.

Proposed Mission for SC-IPON

The Mission for SC-IPON is to consolidate the in-depth understanding of our Indo-Pacific through a series of coordinated, integrated, and sustained observations and research campaigns. The knowledge-based planning and implementation of the sustained Indo-Pacific ocean observing systems underpin the sustainable development in the region through providing the integrated oceanic information and forecasting service.

Objective of SC-IPON

The objective of SC-IPON is to promote and enhance the coordination and cooperation among institutions in the Indo-Pacific region in the development and maintenance of the Indo-Pacific Ocean Observations and Services Network (IPON) in order to reveal the Indo-Pacific oceanic processes and their complex interactions with atmosphere, biosphere, lithosphere, and humans; and to deliver benefits of ocean observations and services to the Indo-Pacific societies, such as the reduction of loss of life and property from natural disasters, protection of human health and well-being, improvement of weather prediction, and conservation of marine biodiversity and ecosystems.

¹ North East Asian Regional Global Ocean Observing System

² South East Asian Global Ocean Observing System

³ Indian Ocean Global Ocean Observing System

⁴ Tropic Pacific Observing System

⁵ Tropical Atmosphere Ocean/Triangle Trans-Ocean Buoy Network

⁶ Indian Ocean Observing System

⁷ Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction

⁸ Northwestern Pacific Ocean Circulation and Climate Experiment

⁹ Western Pacific Equatorial Time Series Observation

¹⁰ Northwestern Pacific Ocean Study on Environment and Interactions between Deep Ocean and Marginal Seas

¹¹ Indonesian Through Flow

¹² Indian Ocean Tsunami Warning and Mitigation System

SC-IPON will endeavor to address the following research priority areas in an integrated way, identified by the WESTPAC Advisory Group (ref.: IOC/SC-WESTPAC-Advisory Group 2013) and initiated by previous WESTPAC Officers at its first meeting in 2008. WESTPAC aims to identify the most compelling regional issues and improve understandings in the key areas of: 1) the role of the Indo-Pacific in climate change and variability; 2) marine biodiversity and food security; 3) the health of ocean ecosystems and its sustainability; and, 4) ocean-related disaster risk reduction.

Annex II to Recommendation SC-WESTPAC-X.3

Terms of Reference of a Scientific Steering Committee on the Development of Indo-Pacific Ocean Observations and Services Network (SC-IPON)

Composition

SC-IPON should be comprised of experts nominated by institutions willing to participate in the development of the Indo-Pacific Ocean Observations and Services Network (IPON), and appointed by the IOC Sub-Commission for the Western Pacific (WESTPAC).

Nominations of candidates for the membership in SC-IPON should be made by participating marine institutions in close consultation and agreement with relevant IOC national focal points for WESTPAC. The WESTPAC Advisory Group (AG) will decide on the membership of SC-IPON based on the nominations made by the participating institutions, taking into consideration geographic, gender and disciplinary balance. WESTPAC AG may invite additional experts to the SC-IPON, as appropriate.

The Committee shall elect two Co-chairpersons among the members. The Committee shall meet at least once per year but may meet more frequently, if required. Other appropriate affiliated organizations can attend the sessions as observers.

Generic Terms of Reference:

- Provide scientific and technical oversight for the planning, development and implementation of IPON,
- Develop relevant strategy and implementation plan of IPON with a view to identifying and bridging the gaps between present observations and services and the requirements to meet socio-economic and environmental needs.
- Report progress to the IOC Sub-Commission for the Western Pacific (WESTPAC) and its Advisory Group.

Funding

The total cost for operating SC-IPON will be significant. Most of the resources will be provided through existing national and international mechanisms, and by voluntary contributions to special projects.

Unless otherwise agreed, any costs arising from the operation of SC-IPON activities will be borne, on a basis of voluntary financial contribution, by participating institutions and their countries. However, such activities will be subject to the availability of funds, personnel, and other resources.

Secretariat Support

An IPON Office shall be established at the host institution of one of the Co-chairs of SC-IPON with staff mainly seconded by the institute. The main work of the Office is to provide support for the operation of SC-IPON in close consultation with the WESTPAC Office.

Recommendation SC-WESTPAC-X.4

WESTPAC PROGRAMME AND BUDGET FOR MAY 2015–MAY 2017

The IOC Sub-Commission for the Western Pacific (WESTPAC),

Noting the reports of the Technical Secretary for IOC Sub-Commission for the Western Pacific on intersessional activities and the WESTPAC Programme and Budget, May 2015–May 2017, contained in documents IOC/SC-WESTPAC-X/6, 7 and 16,

Expressing its appreciation to the Royal Thai Government for its continued support to the IOC Regional Office for WESTPAC (WESTPAC Office), and those Member States for their in-cash and in-kind contributions in support of the implementation of the WESTPAC Programme and Budget for May 2012–May 2015,

Acknowledging the importance of the WESTPAC Office for the success of the programme implementation,

Noting with great concern the dramatic reduction in the allocation of the IOC regular budget for WESTPAC activities as a result of the financial crisis experienced by UNESCO and IOC since late 2011, due to the withholding of the United States of America and Israel's assessed contributions to UNESCO following the 36th General Conference vote admitting Palestine as a Member State of UNESCO,

Further noting that the \$ 507 M Expenditure Plan of UNESCO for 2016–2017 foresees the IOC regular budget allocation, which is increased by \$ 1 M over the previously anticipated value, bringing it to \$ 9.7 M for the biennium 2016–2017,

Being aware of the IOC Draft Programme and Budget for 2016–2017 submitted for consideration by the IOC Assembly at its 28th Session (IOC-XXVIII, Paris, 18–25 June 2015), in which \$ 115 K was allocated to WESTPAC for its activities over 2016–2017,

Recognizing that WESTPAC Programme and Budget serves as guidance on activities that the Sub-Commission would like to jointly promote and seek funding from various sources in support of their implementation,

Adopts the WESTPAC Draft Programme and Budget for May 2015–May 2017 in the Annex to this Recommendation;

Urges Member States to continue and increase their support to WESTPAC and its Office through direct and in-kind contributions;

Requests the Executive Secretary of IOC and other organizations co-operating with WESTPAC to allocate necessary resources and assist in obtaining extrabudgetary funds from governmental and donor agencies.

WESTPAC PROGRAMME AND BUDGET FOR MAY 2015–MAY 2017

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
POLICY AND COORDINATION							
WESTPAC Advisory Group Meeting	1. WESTPAC Advisory Group meeting 2016	<ul style="list-style-type: none">Review the implementation of WESTPAC activities and come up with guidance		At least two times: early 2016 and late 2016, in conjunction with the ISSC Meeting	/	16 K	10 K
10th WESTPAC International Scientific Symposium	1. International Scientific Steering Committee	<ul style="list-style-type: none">identify main themes and key sub-themesdiscuss and finalize the detailed programme for the 10th WESTPAC Symposium	<ul style="list-style-type: none">Symposium Programme	early 2016 & late 2016, Qingdao, China	15 K	/	10 K
	2. Organization of the 10th Symposium	<ul style="list-style-type: none">Successful organization of the 10th Symposium	<ul style="list-style-type: none">Proceedings and/or new proposals for WESTPAC	First half of 2017, Qingdao, China,	25 K	40 K	80 K
11th Intergovernmental Session	1. Organization of the session	<ul style="list-style-type: none">Regional consensus reached on its program, new officers elected	<ul style="list-style-type: none">Summary report	First half of 2017, Qingdao, China, in conjunction with the Symposium	20 K	/	20 K
Operation of WESTPAC Office	1. Development, coordination and implementation, and resources mobilization of WESTPAC activities	<ul style="list-style-type: none">Ensure the full operation of the Sub-Commission and implementation of workplan	<ul style="list-style-type: none">New activities developed, workplan implemented and quality service provided	May 2015-May 2017 Thailand	40 K	100 K	50 K (Thailand and others)
OCEAN PROCESSES AND CLIMATE IN THE INDO-PACIFIC							
North East Asian Regional-GOOS (NEAR-GOOS)	1. 16th NEAR-GOOS CC meeting	<ul style="list-style-type: none">To review the implementations and decide work plan	<ul style="list-style-type: none">Action plans and recommendations on new activities	Nov 2015 Tokyo, Japan	/	2 K	10 K
	2. Communications with member states in the region for their involvement in the project	<ul style="list-style-type: none">To establish the NEAR-GOOS WG on Products and re-constitute the NEAR-GOOS WG on Data Management		During the inter-sessional period	/	/	/
	3. Convene the WG on new NEAR-GOOS products	<ul style="list-style-type: none">To improve oceanographic data products and services in the region	<ul style="list-style-type: none">Recommendation on new products	Details will be discussed in the 16th CC meeting	/	5 K	10 K
	4. Convene the WG on Data	<ul style="list-style-type: none">To operate NEAR-GOOS	<ul style="list-style-type: none">Improvement of	Details will be	/	5 K	10 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
	Management	databases efficiently and effectively	databases operating	discussed in the 16th CC meeting			
	5. 17th NEAR-GOOS CC meeting	<ul style="list-style-type: none"> To review the implementations and decide work plan 	<ul style="list-style-type: none"> Action plans and recommendations on new activities 	late 2016	/	2 K	10 K
South East Asian Regional-GOOS (SEAGOOS)	Ocean Forecasting System (OFS)						
	1. Operation of the OFS	<ul style="list-style-type: none"> To run OFS and provide products to serve a wide range of users 	<ul style="list-style-type: none"> 3 days forecasting products 	Daily	/	30 K	300 K
	2. Data support for OFS	<ul style="list-style-type: none"> To set up ocean monitoring net 	<ul style="list-style-type: none"> 3-5 buoys, HF Radar, coastal stations 	Indian and Pacific Oceans	/	/	800 K
	3. Workshops	<ul style="list-style-type: none"> To discuss and solve problems faced by OFS 	<ul style="list-style-type: none"> Workshop reports 	2015 and 2016	/	10 K	30 K
	4. Training course	<ul style="list-style-type: none"> To train young scholars 	<ul style="list-style-type: none"> Improved capacity on OFS 	2015 and 2016	/	10 K	30 K
	Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI)						
	1. Summer school and Expert Workshop	<ul style="list-style-type: none"> To train the young scientists, to promote science 	<ul style="list-style-type: none"> Improved capacity and better understanding 	Aug. 2015, China	/	10 K	20 K
	2. Summer school and Expert Workshop	<ul style="list-style-type: none"> To train the young scientists, to promote science 	<ul style="list-style-type: none"> Improved capacity and better understanding 	Aug. 2016, Myanmar	/	10 K	20 K
	3. Summer school and Expert Workshop	<ul style="list-style-type: none"> To train the young scientists, to promote science 	<ul style="list-style-type: none"> Improved capacity and better understanding 	Aug. 2017, Thailand	/	10 K	20 K
	4. Cruises	<ul style="list-style-type: none"> Deep ocean-continental interaction 	<ul style="list-style-type: none"> data and reports 	Mar & Nov respectively in 2015, 2016, 2017 Andaman Sea	/	/	300 K
	5. Cruises	<ul style="list-style-type: none"> Upwelling 	<ul style="list-style-type: none"> Data and reports 	May or Aug respectively in 2015, 2016, 2017 South Java	/	/	600 K
	Ocean Acidification and its Impacts on Marine Ecosystems (OAIME)						
	1. First regional workshop	<ul style="list-style-type: none"> share OA monitoring and research approaches, methods, and techniques establish an OA monitoring and research network develop a joint long-term monitoring program on the impacts of ocean acidification 	<ul style="list-style-type: none"> OA research and monitoring network established; Status on OA research and monitoring reviewed; Action plan identified 	Early of 2015	/	20 K	5 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
		on coral reefs, and joint research on ocean acidification and its related changes/processes in seawater chemistry in the region					
	2. The technical training workshop	<ul style="list-style-type: none"> To improve the capacity of OAIME participating institutes for OA monitoring and relevant data analysis techniques 	<ul style="list-style-type: none"> Capacity improved for OA monitoring and data analysis 	Late of 2015	/	10 K	20 K
	3. follow-up workshop on OA monitoring and data analysis	<ul style="list-style-type: none"> To report on national progress on OAIME project To further discuss about the application of OA monitoring and data analysis techniques 	<ul style="list-style-type: none"> Action plan for OA monitoring and research over the next intersessional period, and beyond 	Sep 2016	/	5 K	30 K.
	4. The third meeting of PSC and finalize the report to IOC-WESTPAC	<ul style="list-style-type: none"> To wrap up the final result and provide perspectives actions agreed on towards the future OAIME such as experimental study on marine ecosystem or lab experiment 	<ul style="list-style-type: none"> Final draft of the OAIME report Build up OAIME expert in the region including establishment of OA network at regional level and be at a part of Global network 	Feb 2017	/	13 K	2 K Local logistic
Air-Sea Interaction in the Kuroshio Extension and its Climate Impact	1. The third 'International Symposium on Boundary Current dynamics'	<ul style="list-style-type: none"> Discuss the studies in the Western Boundary Regions 	<ul style="list-style-type: none"> Improve understanding of the boundary current dynamics and raise level of climate prediction 	Jul 2016, Qingdao, China	/	10 K	50 K
	2. Ocean Science Meeting	<ul style="list-style-type: none"> Summarize progress and perspective 	<ul style="list-style-type: none"> Set the new scientific goals for the next 5 years and involve more international collaboration 	Feb 2016, New Orleans, USA	/	/	10 K
	3. Cruise in 2016	<ul style="list-style-type: none"> Obtain the mooring buoy data and place Argo Floats 	<ul style="list-style-type: none"> Enhance the international cooperation in observation in the Kuroshio extension region 	Apr 2016, Kuroshio extension region	/	/	2,000 K
	4. Cruise in 2017	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	Apr 2017, Kuroshio extension region	/	/	2,000 K
	5. Cruise in 2018	<ul style="list-style-type: none"> As above 	<ul style="list-style-type: none"> As above 	Apr 2018,	/	/	2,000 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
				Kuroshio extension region			
South China Sea Fluvial Sediments and Environmental Change	1. Research cruise	<ul style="list-style-type: none"> Sediment cores and data collection 	<ul style="list-style-type: none"> Case study of shelf in NW South China Sea: shallow seismic dataset, surface and suspended sediments, sediment gravity cores, and hydrological data 	Aug 2015, Gulf of Tonkin	/	/	50 K
	2. 8th FluSed workshop	<ul style="list-style-type: none"> Exchange of scientific results 	<ul style="list-style-type: none"> Strengthen collaboration: joint writing manuscripts, data comparison, further cooperation discussion 	Oct 2015, Vietnam	/	20K	20 K
	3. Research cruise	<ul style="list-style-type: none"> Seismic data and sediments collection 	<ul style="list-style-type: none"> Case study of the Sunda Shelf: shallow seismic dataset, surface and suspended sediments, and sediment gravity cores 	Aug 2016, Sunda Shelf	/	/	120 K
	4. 9th FluSed workshop	<ul style="list-style-type: none"> Exchange of scientific results 	<ul style="list-style-type: none"> Strengthen collaboration: joint writing manuscripts, data comparison, further cooperation discussion 	Nov 2016, Indonesia or Singapore	/	20 K	20 K
Upwelling Studies through Ocean Data Integration towards Sustaining Ocean Health and Productivity	1. First meeting with group members	<ul style="list-style-type: none"> discuss about workplan; prepare appropriate technical plan and schedule 	<ul style="list-style-type: none"> Finalize work scope and group task Detail schedule and work plan 	Oct 2015	/	8 K	5 K
	2. Short report on established upwelling site in the region	<ul style="list-style-type: none"> prepare short report and compile references on established upwelling site in the region; discuss key issues related to data collection and integration method and implementation 	<ul style="list-style-type: none"> Short report of established upwelling site in SCS and surrounding seas Implementation of standard data collection and data integration methods 	Jul 2016	/	0.5 K	2 K
	3. Field data collection, satellite images, numerical model	<ul style="list-style-type: none"> plan and conduct data collection at upwelling region organize and integrate field 	<ul style="list-style-type: none"> Each country involved will have their own set of planning for field data 		/	/	200 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
		data, satellite data and numerical model in compiling information regarding upwelling	collection <ul style="list-style-type: none"> All integrated data from different countries are compiled and comparison study are conducted 				
	4. Upwelling Training course/Field Trip for Marine Scientists	<ul style="list-style-type: none"> To provide exposure to marine scientists to join scientific cruise that collect data related to upwelling study To provide young scientists with competency and opportunity to deepen their expertise by enhancing experience and knowledge on data collection. 	<ul style="list-style-type: none"> Cruises that collected upwelling data and provide training at one of the study area in the region Experts/Scientists that are well trained to diffuse knowledge on conduct data collection especially related to upwelling study 	Jul 2016	/	8 K	30 K
Indo-Pacific Ocean Environmental Variations and Air-Sea Interactions (IPOVAI)	1. Workshop	<ul style="list-style-type: none"> Communication for the scientific outcome 	<ul style="list-style-type: none"> Identify the common interest , generate the annual report 	One Open Science meeting and two workshops will be organized in 2015,2016,2017 in China and WESTPAC member states	/	20 K	100 K
	2. In situ observation	<ul style="list-style-type: none"> Collect data on air-sea interaction 	<ul style="list-style-type: none"> The database 	2016,2017 in Indian Ocean and Western Pacific	/	/	900 K
	3. Capacity building	<ul style="list-style-type: none"> Training the early careers 	<ul style="list-style-type: none"> The skilled researcher 	2015-2017, in China	/	10 K	50 K
	4. Model develop and transplant	<ul style="list-style-type: none"> New coupled and ocean models 	<ul style="list-style-type: none"> Coupled model 	2015,2016,2017 in China and WESTPAC member states	/	/	600 K
Indo-Pacific Ocean Observations and Services Network (SC-IPON)	1. Intersessional Task Force on SC-IPON	<ul style="list-style-type: none"> Identify options for the secretariat support 	<ul style="list-style-type: none"> Secretariat support materialized 	At least two times	/	/	8 K
	2. First meeting of SC-IPON	<ul style="list-style-type: none"> Discuss about strategy and 	<ul style="list-style-type: none"> Strategy and workplan 	2016	/	10 K	10 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
		workplan	finalized				
MARINE BIODIVERSITY, HEALTHY ECOSYSTEMS AND SEAFOOD SAFETY							
Marine and Coastal Biodiversity and Conservation	1. Workshop: updating a list of marine non-indigenous species in the WESTPAC region	<ul style="list-style-type: none"> To summarize a list of marine non-indigenous species in the WESTPAC region To increase public awareness on the impact of marine NIS 	<ul style="list-style-type: none"> Report/scientific paper of a list of marine non-indigenous species in the WESTPAC region 	Aug/Sep 2015	/	15 K	5 K
	2. Workshop: updating techniques for coral restoration in the WESTPAC region	<ul style="list-style-type: none"> To summarize all coral restoration techniques available within the Western Pacific region and outside the regions To promote those techniques among WESTPAC member countries 	<ul style="list-style-type: none"> Report/scientific paper of coral restoration techniques available within the WESTPAC region 	Aug/Sep 2015	/	10 K	5 K
	3. Preparing 2 books related to list of marine non-indigenous species and coral restoration techniques	<ul style="list-style-type: none"> To disseminate the synthesis data on marine NIS in the WESTPAC region through scientific communities To disseminate the synthesis data on coral restoration techniques through scientific communities 	<ul style="list-style-type: none"> Books 	Dec 2015	/	/	/
	4. Collaborating with IOC/WESTPAC Office on IOC/WESTPAC ocean acidification project	<ul style="list-style-type: none"> To help in monitoring the impact of ocean acidification on marine ecosystems in the WESTPAC region with emphasis on biological aspects 	<ul style="list-style-type: none"> Methods for monitoring ocean acidification for biological part 		/	/	/
Coral Reef under Climate and Anthropogenic Perturbations	1. Workshops for WESTPAC-CorReCAP Project	<ul style="list-style-type: none"> To do the synthesis on the existing knowledge and review of research experiences 	<ul style="list-style-type: none"> Articles and workshop reports 	TBD	/	10 K	TBD
	2. Summer schools for WESTPAC-CorReCAP Project	<ul style="list-style-type: none"> To promote the capacity development for IOC/WESTPAC-CorReCAP studies 	<ul style="list-style-type: none"> Reports 	TBD	/	10 K	TBD
DNA Taxonomy and Recruitment Monitoring of the Coral Reef Marine	1. Planning workshop for the 2nd Phase	<ul style="list-style-type: none"> To make a plan for the implementation of the project 	<ul style="list-style-type: none"> Implementation plan of the project 	late 2015, Phuket, Thailand	/	15 K	5 K
	2. Expansion of inventories	<ul style="list-style-type: none"> To expand the database on 	<ul style="list-style-type: none"> Inventories on marine 	Continuous; each	/	35 K	5 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
Organisms	in each participating country	marine organisms living in coral reefs	organisms	country			
	3. Operation and updating the portal system linking the inventories	<ul style="list-style-type: none"> To share the database information on the marine organisms through the open WESTPAC portal site 	<ul style="list-style-type: none"> The WESTPAC portal site containing marine organism data 	Continuous; Seoul, Korea	/	40 K	5 K
	4. Training course on DNA barcoding and recruitment monitoring	<ul style="list-style-type: none"> To exchange the genetic analysis techniques and to enhance the capacity for species identification and recruitment monitoring 	<ul style="list-style-type: none"> Workshop report and collaboration network 	Apr, 2016; Bangkok, Thailand (or Jakarta, Indonesia)	/	40 K	5 K
	5. Wrap-up workshop	<ul style="list-style-type: none"> To review the results of implementation of the project and to discuss its follow-ups 	<ul style="list-style-type: none"> Implementation report of the project 	Dec, 2016; Seoul, Korea	/	20 K	5 K
Marine Toxins and Seafood Safety	1. The 4th IOC/WESTPAC-TMO training workshop on "Standardization of protocol to study on domoic acid in the environment and shellfish for WESTPAC region"	<ul style="list-style-type: none"> To standardize method to study domoic acid in the region 	<ul style="list-style-type: none"> Protocol to study on domoic acid in the environment and shellfish for WESTPAC region Enhance capacity on toxin study in the region 	Oct 2015, Vietnam	/	15 K	/
	2. The 6th IOC/WESTPAC-TMO workshop	<ul style="list-style-type: none"> To develop Guidebook on marine toxins 	<ul style="list-style-type: none"> Outline of Guidebook on marine toxins Organizing capacity building activities to lessen poisoning incidents 	Mar/Apr, 2016 Malaysia/ Singapore	/	10 K	/
	3. The 5th IOC/WESTPAC-TMO training workshop on "chemical analysis of domoic acid in shellfish and plankton samples"	<ul style="list-style-type: none"> To develop technical guidance for chemical analysis of domoic acid in shellfish and plankton samples 	<ul style="list-style-type: none"> Technical guidance for chemical analysis of domoic acid in shellfish and plankton samples Enhance capacity on domoic acid study in the region. To develop IOC/WESTPAC - RTRC on domoic acid study 	Nov/Dec 2016 Vietnam	/	30 K	/
	4. The 7th IOC/WESTPAC-TMO workshop	<ul style="list-style-type: none"> To review and finalize contents and structure of Guidebook on 	<ul style="list-style-type: none"> Draft Guidebook on marine toxins 	May, 2017 Thailand/ Singapore	/	20 K	/

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
		marine toxins	<ul style="list-style-type: none"> Organizing capacity building activities to lessen poisoning incidents 				
Harmful Algal Blooms	1. Strategic meeting	<ul style="list-style-type: none"> Discussion on future activities, especially on capacity building, and scientific development including the social science approach 	<ul style="list-style-type: none"> List of training courses Drafts of outreach material 	TBD	/	20 K	/
	2. Establishment of regional network	<ul style="list-style-type: none"> Facilitation of information exchange and dissemination 	<ul style="list-style-type: none"> Networking 	2015-2017	/	/	/
	3. Capacity building	<ul style="list-style-type: none"> Local training workshops 	<ul style="list-style-type: none"> Trained scientists and technicians 	2015-2017	/	20 K	30 K
	4. Interaction with other HAB projects	<ul style="list-style-type: none"> Information exchange and collaboration of activities 	<ul style="list-style-type: none"> Enhance effectiveness of activities 	2015-2017	/	/	/
	5. Production of outreach material	<ul style="list-style-type: none"> Information dissemination 	<ul style="list-style-type: none"> Better understanding on HAB problems 	2015-2017	/	/	3 K
	6. Preparation of textbook	<ul style="list-style-type: none"> Increase effectiveness of training 	<ul style="list-style-type: none"> Increased skill of HAB monitoring, improved training material 	2015-2017	/	/	30 K
Ocean Remote Sensing for Coastal Habitat Mapping	1. Strategic meeting	<ul style="list-style-type: none"> Discussion on future activities, especially on capacity and scientific developments 	<ul style="list-style-type: none"> List of training courses Drafts of outreach material 	2015-2016	/	20 K	/
	2. Establishment of regional network	<ul style="list-style-type: none"> Facilitation of information exchange and dissemination 	<ul style="list-style-type: none"> Networking 	2015-2017	/	/	/
	3. Capacity development	<ul style="list-style-type: none"> Training workshops 	<ul style="list-style-type: none"> Trained scientists and students 	2015-2017	/	20 K	20 K
	4. Interaction with other coastal habitat mapping projects	<ul style="list-style-type: none"> Information exchange and collaboration of activities 	<ul style="list-style-type: none"> Enhance effectiveness of activities 	2015-2017	/	/	/
	5. Production of outreach material	<ul style="list-style-type: none"> Information dissemination 	<ul style="list-style-type: none"> Better understanding on coastal habitats and necessity of mapping by remote sensing 	2015-2017	/	/	3K
	6. Preparation of textbook	<ul style="list-style-type: none"> Increase effectiveness of training 	<ul style="list-style-type: none"> Increase and standardization of coastal habitat mapping techniques with remote sensing and production 	2015-2017	/	/	3K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
			of training material				
Regional Study of Marine Endangered Species (Mammals and Sea Turtles) in the Tropical Asia for Effective Conservation (MESTA)	1. Project meeting A: 1st Scientific Symposium on Tropical Indo-Pacific Marine Endangered Species	• Knowledge communication, annual work plan making and network formation	• Inception of the MESTA network	Thailand, 2015	/	5 K	15 K
	2. Project meeting B: 2nd Scientific Symposium on Tropical Indo-Pacific Marine Endangered Species	• Knowledge communication, annual work plan making and network formation	• Development of the MESTA network, project's follow-up phase proposal	Malaysia, 2017	/	5 K	10 K
	3. Project training: 1st Training Course on Observation of Tropical Indo-Pacific Marine Endangered Species	• Knowledge and technical skills transfer	• Capacity building of the MESTA network	Thailand/ Malaysia, 2016	/	5K	10 K
ENHANCED KNOWLEDGE OF EMERGING OCEAN SCIENCE ISSUES							
WG003: Mapping the Harmful Jellyfishes in the Tropical West Pacific Waters	1. Establishment of web based information exchange within the Working Group	• Improve knowledge on jellyfish hazards and promote communications	• Inauguration and maintenance of webpage for the Working Group	Jun 2015 - May 2017	/	5 K	/
	2. Bilateral and multilateral exploration of potential cooperation among WG members	• Explore more partners and the focus and methods for the follow-up activities	• More partners involved, identify the focus and methods for the follow-up activities	Jun 2015 - Feb 2017	/	/	/
	3. International training course on taxonomy of venomous jellyfish species	• Dissemination of skills for taxonomy of jellyfish species in the region.	• Capacity building on taxonomy of jellyfish species for follow-up research in the region.	Jun 2015 – May 2016 Thailand or Malaysia	/	5 K	20 K
	4. WG meeting	• Discuss and decide the WG's follow-up and whether apply for new project	• Application of WG's extension or new project	Mar 2017 Malacca City	/	5 K	10 K
WG004: Marine Renewable Energy Technology Development (MRET)	1. Focus expert working group meeting	• To review report from MRE survey and to discuss technical status and plan for next steps for possible proposal for pilot project • To identify experts participating and key donor countries for		Aug 2015, Malaysia	/	8 K	10 K

Project/Programme	Activities	Objectives	Expected outputs	Date and Place	Funding Required, US\$		
					IOC (in-cash)		Other in-kind sources (national or internat'l)
					Regular	Extra budget	
		MRE project <ul style="list-style-type: none"> To seek further interest from participating countries in sponsoring and constructing a pilot project 					
	2. Workshop on designing a proposal for pilot project	<ul style="list-style-type: none"> To review and support for feasibility of a pilot project on MRE in WESTPAC To prepare detailed design and implementation plan 	<ul style="list-style-type: none"> Project design proposal, site selection Detailed design & implementation plan 	2016 2017	/	5K	20 K
CAPACITY DEVELOPMENT FOR MARINE SCIENCE, OBSERVATIONS AND SERVICES							
UNESCO/IOC Regional Training and Research Center on Ocean Dynamics and Climate							
IOC Regional Network of Training and Research Centers on Marine Science	1. RTRC-ODC: 5th Training Course	<ul style="list-style-type: none"> Training course on climate change 	<ul style="list-style-type: none"> Improved understanding and practice of prediction on climate change 	Sep 2015, Qingdao, China	/	15 K	60 K
	2. RTRC-ODC: 6th Training Course	<ul style="list-style-type: none"> Training course on ocean dynamics and multi-scales interaction 	<ul style="list-style-type: none"> Improved understanding on ocean dynamics 	2016, Qingdao, China	/	15 K	60 K
	3. RTRC-ODC: 7th Training Course	<ul style="list-style-type: none"> Training course on the development of coupled regional ocean models 	<ul style="list-style-type: none"> Improved understanding on coupled regional ocean models 	2017, Qingdao, China	/	15 K	60 K
	4. Development of other RTRCs	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> 		15 K		15 K
Sub-total					115 K	842.5 K	10,976 K
Total					11,933.5 K		

Recommendation SC-WESTPAC-X.5

DATE AND PLACE OF THE NEXT SESSION

The IOC Sub-Commission for the Western Pacific (WESTPAC),

Bearing in mind the need for a sufficient period of time between sessions of WESTPAC to allow the implementation of its activities,

Recalling Recommendation SC-WESTPAC-I.3 in 1990 to have a three-year time span between its regular sessions,

Further recalling Recommendation SC-WESTPAC-VII.6, adopted at the Seventh Session of WESTPAC (WESTPAC-VII, Sabah, Malaysia, 26–29 May 2008), which decided to reschedule the period between sessions from three years to two years beginning with the closure of WESTPAC-VII, to be in phase with IOC planning cycles. Further, WESTPAC sessions will be scheduled during the first quarter of the year so that its decisions, recommendations, and reports can be forwarded to the IOC Executive Secretary in time for review and consideration by the Assembly,

Appreciates the Royal Thai Government for hosting the Tenth Intergovernmental Session on 12–15 May 2015, Phuket, Thailand and excellent arrangements made for the session;

Accepts with appreciation the consideration of the Government of People's Republic of China to host the Eleventh Intergovernmental Session in early 2017, subject to the final endorsement of the relevant authorities.

ANNEX III

OPENING REMARKS

Opening Remarks of Dr Punlop Singhasene
Vice Governor of the Phuket Province

Dr Vladimir Ryabinin, Executive Secretary of IOC;

Mr Vudhichai Janekarn, Deputy Director-General, Department of Marine and Coastal Resources;

Dr Sang-Kyung Byun, IOC Chairperson;

Dr Somkiat Khokiatiwong, WESTPAC Chairperson;

Dr Youn-Ho Lee, WESTPAC First Vice-Chairperson;

Dr Vo Si Tuan, WESTPAC Second Vice-Chairperson;

Mr Zhu Wenxi, WESTPAC Head & Programme Specialist;

Distinguished guests and delegates;

Ladies and Gentlemen,

It is my honour and privilege to extend my warmest welcome to all the participants of the Tenth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific.

I am very pleased to be informed that Phuket Province is selected to be the venue for this intergovernmental meeting hosted by the Department of Marine and Coastal Resources, Ministry of Natural Resources and Environment and UNESCO/IOC Sub-commission for the Western Pacific. As the meeting is about marine science, observations and services including marine and coastal resources management and research addressing critical challenges to healthy marine ecosystems and sustainable development in this and near-by regions, I do believe that the scientific knowledge provided by IOC/WESTPAC and the outcome of this meeting will be of great benefit to the government and relevant stakeholders in Phuket, a coastal province of Thailand, which receives the influence for surrounding sea in the Eastern Indian Ocean as well.

Distinguished guests and participants,

Once again, please accept my warm welcome to Phuket Province which is definitely one of the most important tourist seaside destinations in Thailand and is also well recognized as one of the world tourist destination, where there are variety activities and places which have beautiful scenery of beaches and tropical nature to enjoy. As Phuket and its vicinity is an ideal for enjoying water sport such as diving, snorkelling, wind surfing and sailing, the province attracts high number of tourist visitors which is about 13-15 million each year. The growing number of the tourists of course has effects on marine environment and resources, therefore, scientific knowledge and information is important for the management of Phuket province. I would like to thanks the Phuket Marine Biological Centre, Department of Marine and Coastal Resources for always providing information to support the province.

I believe that many of you have tasted Thai food or have heard about the tasty of Thai food. I hope that during your stay, you can enjoy not only Thai food, but also its seafood as

Phuket is one of the best seafood place in Thailand. There are a number of seafood restaurants providing fresh seafood along the beach as well as local food available in the markets and city center.

I wish this conference a great success according to its objectives. At the same time, I wish all of you a happy stay in Phuket Province. I also hope that Phuket will have another opportunity to welcome all of you again in the future.

Thank you.

Opening Remarks of Mr Vudichai Janekarn
Deputy Director General, Department of Marine and Coastal Resources
Ministry of Natural Resources and Environment, Thailand

Dr Vladimir Ryabinin, Executive Secretary of IOC;

Dr Punlop Sinhasene, the Vice Governor of Phuket Province;

Dr Sang-Kyung Byun, IOC Chairperson;

Dr Somkiat Khokiatiwong, Dr. Youn-Ho Lee, Dr. Vo Si Tuan;

Mr Zhu Wenxi;

Distinguished delegates of Member States and Representatives of International Organizations;

Ladies and Gentlemen,

First of all, may I present my warm gratitude to you all and express my sincere thanks for your impressive share in this important forum.

Well, on behalf of the Ministry of Natural Resources and Environment, under the Royal Thai Government, it is my great pleasure and honour to host the Tenth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-X) and may I extend my warmest welcome you all to this important session.

In realizing the importance of ocean science to the wellbeing of humanity, Thailand has been providing strong support to the activities of the UNESCO/IOC both in global and regional levels. Regarding to global level, Thailand has joined quite a number of activities and programme of UNESCO/IOC such as

- Tsunami Warning System,
- Global Ocean Observation System (GOOS),
- Global Sea Level Observing System,
- Harmful Algae Bloom,
- International Oceanographic Data and information Exchange,
- Joint Technical Commission for Oceanography and Marine Meteorology and etc.

At the regional level, the Royal Thai Government has been hosting IOC/WESTPAC Office and providing both administrative and in-cash supports since its establishment in November 1994, which was initially hosted by the National Research Council of Thailand (NRCT) from 1994-2004, and subsequently hosted by the Department of Marine and Coastal Resources (DMCR) since 2005 up till now. As the role of the host country to the IOC/WESTPAC

Office, I would also like to take this opportunity to reiterate our strong support and full cooperation to IOC/WESTPAC.

In addition, Thailand has closely and enthusiastically participated in many activities of IOC/WESTPAC, for example, the programmes related to Southeast Asia Global Ocean Observing System or SEAGOOS which involve

- Monsoon Onset Monitoring and Its Social and Ecosystem Impacts (MOMSEI),
- Ocean Forecasting System (OFS), and
- Ocean Acidification (OA).
- The programmes are dealing with Marine Science and Application such as
- Harmful Algal Bloom,
- Toxic Marine Organism,
- Ocean Remote Sensing,
- Response of Marine Hazard to Climate Change,
- Marine Biodiversity and etc.

Thailand has placed an importance on Capacity Development on ocean science of the WESTPAC region, therefore, the Royal Thai government has provided the budget through the Department of Marine and Coastal Resources and the Thai National Commission for the UNESCO so as to conduct a marine and ocean science training course every year during the last inter-sessional period and also explore the possibility to the continuity of the course.

Distinguished delegates and participants,

Nowadays, there are many challenges related to climate change on marine and coastal resources to be managed. The impacts of climate change have become a significant concern to all countries in the region, in particular on marine ecosystem and resources, such as sea level rise, ocean-acidification, and also relating to natural hazards, including storm surge, typhoon, monsoon and the adverse effect of climate change. Though climate change is a threat to human being as well as natural resources and environment, an understanding of the effects of climate change especially on oceans is not yet comprehensive. Therefore, education, research and development of the appropriate model at the regional and global levels are crucial to improve understanding of impact, mitigation and adaptation in terms of climate change.

Well, to my knowledge, marine environmental problems are transboundary issues, thus cooperation among countries and with organizations is truly needed both at the regional and global levels in order to reduce threats and hazards, as well as increase and strengthen the protection and conservation of natural resources for sustainable management.

I do hope that the present WESTPAC meeting will bring together competent governmental agencies and scientific communities, leading

- to improve science-policy interface,
- to advance international cooperation on marine science,
- to observations and services, and also
- to improve institutional capacities so as to address critical challenges to sustainable development in the Western Pacific and its adjacent regions.

I do appreciate to learn that this session will be an important forum as a platform for WESTPAC State Members, Representatives of International Organizations, and delegates from various disciplines to share and contribute their experience of work, as well as to strengthen the cooperation in order to tackle the problem both in the areas of mitigation and adaptation for the sustainable management.

Distinguished delegates and participants,

Lastly, I kindly wish that the 10th Intergovernmental Session of the IOC Sub-Commission for the Western Pacific will achieve its objectives with the fruitful outcome by your deliberation under the consensus spirit which will be beneficial to the WESTPAC region. Now, may I declare, the Tenth Intergovernmental session of WESTPAC officially open.

Thank you very much indeed.

Opening Remarks of Dr Vladimir Ryabinin
Executive Secretary of IOC

Dr. Punlop Singhasene, Vice-Governor of Phuket Province;

Mr Vudhichai Jankarn, Deputy Director-General, Department of Marine and Coastal Resources of Thailand;

Dr Sang-Kyung Byun, Chair of IOC;

Dr Somkiat Khokiattiwong, Chairman of IOC/WESTPAC;

Dr Blivi and Dr Michida, IOC Officers;

Dear colleagues, ladies and gentlemen,

It is a great pleasure for me to participate in the opening of the jubilee session of WESTPAC, a very strong regional branch of the Intergovernmental Oceanographic Commission of UNESCO.

I started my work as the Executive Secretary of IOC on 1 March 2015 and since then have been following a very steep learning curve. I will speak very soon, under the agenda item 3.3, and will present to you my first reflections after 73 days in office. However, right now, at the opening, I wish to state just two simple but, I believe, very important things. First of all: we are and continue to be good friends!

I started to work with IOC in early 1990s. Some people know: in 1996 I was selected for a professional job in IOC. The appointment was not approved finally, to my huge disappointment, but I became dedicated to IOC goals. That same year, I participated, together with a number of colleagues in the First session of NEARGOOS Coordinating Committee, which took place in Bangkok, Thailand, and that was where and when we agreed on the first version of the NEARGOOS Implementation Plan, a WESTPAC activity.

So, it is a great pleasure for me to see NEARGOOS continuing to develop and my early participation in this project gives me a sense of ownership for some WESTPAC activities. I also used to work on a storm surge prediction project in Vietnam, and have been involved in some other activities in the WESTPAC region. So, it is a great pleasure to come back to this region and I wish to state that I am very committed to work with you in WESTPAC in my new role.

The second message is that I would like to convey is a big thank you to WESTPAC for the excellent work during the difficult times. The scope of WESTPAC activities is very broad. The ocean science developed by WESTPAC is the cutting edge of oceanography. Your education and capacity development activities are very strong, too.

Scientifically, this is the region of fastest sea-level rise, with strong impact of tropical cyclones, with a very important role of biological and ecosystem oceanography in life support

system of the Member States. The role of the ocean for WESTPAC Member States is key and because of that we cannot afford to fail – IOC needs to see WESTPAC very successful. We value very much the commitment of WESTPAC Member States to oceanography and I feel the very enthusiastic spirit of the WESTPAC community gathered in this room.

Finally, I would like to express, on behalf of IOC, our deepest thanks to the Kingdom of Thailand for your generous support of the WESTPAC office in Bangkok and the whole WESTPAC, for offering such a wonderful venue for our meeting, and for your national contributions to activities of WESTPAC and IOC as a whole. These contributions are very much appreciated.

Let me conclude by wishing you all a very successful and productive session of WESTPAC here in Phuket.

Thank you very much.

Opening Remarks of Dr Somkiat Khokiattiwong
Chairperson of WESTPAC

This year is the 25th year of the IOC Sub-commission for the Western Pacific (WESTPAC) since its establishment in 1989. On this special occasion, it is worth recalling the first regional programme under the auspices of IOC in the region entitled “the Cooperative Study of the Kuroshio and adjacent regions (CSK)”. This regional programme was conducted during 1965-1977 with 12 countries participating in and supporting joint research into this current which flows from the tropic Pacific northward via the East China Sea towards the North Western Pacific.

Since then, a number of activities were carried out in this region with the strong spirit of cooperation gradually built up among countries that led to the generation of WESTPAC. No matter either hard time or difficult time that WESTPAC went through, there are plenty of lessons we shall draw from the past and take good practices for the future. The present success of WESTPAC was built upon great efforts of member states in the region over several generations.

I started my chairmanship of WESTPAC since the Ninth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-IX, Busan, Republic of Korea, 9-12 May 2012). Despite a short service time in my capacity as Chair of WESTPAC compared to its history, I am proud to work for the most outstanding IOC's Sub-Commission, especially with all member states and friends and colleagues in the region. I could see the great change happening to WESTPAC since I got involved in 2005 as the coordinator of the Southeast Asian Global Ocean Observation System (SEAGOOS). At that time, WESTPAC was in a very difficult time without much cooperation and joint activities among countries. Since 2008, we were able to get together and take a difficult revitalization processes, which enables WESTPAC to concert the efforts of countries, revitalize and establish new programs based on the common interests, and rebuild the confidence of countries in WESTPAC. I would say that it couldn't happen without the spirit of cooperation and strong willingness of WESTPAC Member States to support and work together. In-kind and in-cash support to the IOC WESTPAC was rapidly grown up. I firmly believe because we trust in our organization and feel that it belongs to all of us.

WESTPAC has been implementing many projects, programmes, and activities, which are of great help to build up and generate ocean science knowledge to the region especially for the young scientist. I had a chance to participate in some of capacity building activities of WESTPAC long time ago. These activities enable me to learn more about ocean science and to make friends working in the same field in the region. Many of those friends are now working together under the WESTPAC framework. This could keep building up of generation to generation of the ocean science and research in the region. The capacity building is therefore

one of very important activities of the WESTPAC. During the period of my Chairmanship, I had chances to visit and discuss with many member state. I was happy to learn that they all give high priority to building capacity for young scientist and many member countries are also considering to establish the Regional Training and Research Center (RTRCs) under the framework of WESTPAC. I am looking forwards to seeing more new RTRCs.

The results of WESTPAC's projects and programmes have been leading to the development of research projects/programmes in many member countries, as they are very important to the livelihood of people in the coastal community. We did play a lot of attention on the impact of anthropogenic activities to the health of ocean in the past. WESTPAC did very well implementation of those projects and programmes in response to these related issues. However, there are still many challenges member states are faced with in the region such as the impacts of climate change to the ocean and society, etc.

Given lack of knowledge on these changing processes and impacts in the region, WESTPAC has been aware of these impacts, and keeps establishing new projects on the issues. It is not an easy job as it not only requires relevant expertise, but also a lot of resources to support. Since the WESTPAC is handling many activities with limited resources over recent years, It is a challenge to WESTPAC. How can we keep addressing existing issues on one hand and establish new ones on emerging issues under the framework of WESTPAC? My experience during last three years of working very closely with WESTPAC makes me believe that it is with strong collaboration and support from member countries and scientists in the region that could make it a success. I sincerely expect that member states will continue their strong ownership over WESTPAC as they have been doing so in the past. I could not miss pointing out one of very important engine driving WESTPAC, i.e., the WESTPAC office, especially Mr Wenxi Zhu and his staff who have been working diligently behind the success of WESTPAC. They are the greatest assets of WESTPAC and IOC. In this sense, I believe all countries in the region would join me in urging IOC to take effective motivation measures to keep them for WESTPAC and IOC.

Finally I would like to thank all member countries, friends and colleagues who are providing strong support to me during my period of the Chairman of WESTPAC. I enjoy working together with all of you. I do promise I will keep contributing to and working with WESTPAC as much as I can.

ANNEX IV

LIST OF DOCUMENTS

Agenda Items	Title	Document Code
<u>Working Documents</u>		
All	List of Documents	IOC/SC-WESTPAC-X/1
2.1	Agenda	IOC/SC-WESTPAC-X/2
2.1	Timetable	IOC/SC-WESTPAC-X/2.add
All	Provisional Annotated Agenda	IOC/SC-WESTPAC-X/3.prov
--	Draft Summary Report	IOC/SC-WESTPAC-X/4
3.1	Statement of the Chairperson	IOC/SC-WESTPAC-X/5
3.2	Report by the Regional Office on Intersessional Activities	IOC/SC-WESTPAC-X/6
3.2	Report by the Regional Office on Budget Overview	IOC/SC-WESTPAC-X/7
3.3	Recent Developments within IOC/UNESCO, and its Relevance to WESTPAC	IOC/SC-WESTPAC-X/8
3.3	<i>IOC Medium-Term Strategy, 2014-2021</i>	<i>IOC/SC-WESTPAC-X/inf. 10</i>
3.3	<i>Programme and Budget for 2014-2017 and Workplan 2014-2015</i>	<i>IOC/SC-WESTPAC-X/inf. 11</i>
4.1	Twenty-Fifth Anniversary of the Sub-Commission	IOC/SC-WESTPAC-X/9
4.1	<i>WESTPAC Flyer on Highlights of WESTPAC's 25th Anniversary</i>	<i>IOC/SC-WESTPAC-X/inf. 12</i>
4.2	Recommendations from the Ninth WESTPAC International Scientific Symposium in 2014, Nha Trang, Vietnam	IOC/SC-WESTPAC-X/10
4.2	Summary Report on the WESTPAC 9th International Scientific Symposium "A Healthy Ocean for Prosperity in the Western Pacific: Scientific Challenges and Possible Solutions", 22-25 April 2014, Nha Trang Vietnam	IOC/SC-WESTPAC-X/10
4.2	<i>WESTPAC Flyer on WESTPAC 9th International Scientific Symposium "A Healthy Ocean for Prosperity in the Western Pacific: Scientific Challenges and Possible Solutions",</i>	<i>IOC/SC-WESTPAC-X/inf. 13</i>

Agenda Items	Title	Document Code
	<i>22-25 April 2014, Nha Trang Vietnam</i>	
4.3	Progress on the Preparations for the Tenth WESTPAC International Scientific Symposium 2017, Qingdao, China	IOC/SC-WESTPAC-X/11
4.4	WESTPAC Approach to Capacity Development	IOC/SC-WESTPAC-X/12
4.4	<i>WESTPAC Flyer on WESTPAC Approach to Capacity Development in Marine Science</i>	<i>IOC/SC-WESTPAC-X/inf.14</i>
5	Review and Evaluation of Regional Programmes, Projects and Working Groups for May 2012 – May 2015	IOC/SC-WESTPAC-X/13
5.1.1	Progress Report on North East Asian Regional-GOOS	IOC/SC-WESTPAC-X/13.1
5.1.2	Progress Report on South East Asian Regional-GOOS (SEAGOOS), including Ocean Forecasting Demonstration (OFD), and Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI)	IOC/SC-WESTPAC-X/13.2
5.1.2.1	Progress Report on SEAGOOS - Ocean Forecasting System (OFS)	IOC/SC-WESTPAC-X/13.2.1
5.1.2.2	Progress Report on SEAGOOS - Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI)	IOC/SC-WESTPAC-X/13.2.2
5.1.3	Progress Report on Response of Marine Hazards to Climate Change	IOC/SC-WESTPAC-X/13.3
5.1.4	Progress Report on Air-Sea Interaction in the Kuroshio Extension and its Climate Impact	IOC/SC-WESTPAC-X/13.4
5.1.5	Progress Report on South China Sea Fluvial Sediments and Environmental Changes	IOC/SC-WESTPAC-X/13.5
5.2.1	Progress Report on Marine and Coastal Biodiversity and its Management	IOC/SC-WESTPAC-X/13.6
5.2.2	Progress Report on Coral Reef under Climate and Anthropogenic Perturbations	IOC/SC-WESTPAC-X/13.7
5.2.3	Progress Report on DNA Taxonomy and Recruitment Monitoring of the Coral Reef Marine Organisms	IOC/SC-WESTPAC-X/13.8
5.2.4	Progress Report on Marine Toxins and Seafood Safety	IOC/SC-WESTPAC-X/13.9
5.2.5	Progress Report on Harmful Algal Blooms	IOC/SC-WESTPAC-X/13.10

Agenda Items	Title	Document Code
5.2.6	Progress Report on Ocean Remote Sensing for Coastal Habitat Mapping	IOC/SC-WESTPAC-X/13.11
5.3.1	Progress Report on WG 001: Asian Dust and its Impact on Ocean Ecosystem	IOC/SC-WESTPAC-X/13.12
5.3.2	Progress Report on WG 002: World Ocean Assessment	IOC/SC-WESTPAC-X/13.13
5.3.3	Progress Report on WG 003: Mapping Harmful Jellyfishes	IOC/SC-WESTPAC-X/13.14
5.3.4	Progress Report on WG 004: Marine Renewable Energy Technology Development	IOC/SC-WESTPAC-X/13.15
5.4.1	Progress Report on the Development of the UNESCO/IOC Regional Network of Training and Research Centers, related to the Draft IOC Capacity Building Strategy	IOC/SC-WESTPAC-X/13.16
5.4.2	Progress Report on IOC Regional Training and Research Center on Ocean Dynamics and Climate	IOC/SC-WESTPAC-X/13.17
5.4.3	IOC Capacity Building Strategy	IOC/SC-WESTPAC-X/13.8
5.4.3	IOC Capacity Development Strategy 2015-2021, Version 4 March 2015	IOC/SC-WESTPAC-X/13.18.1
5.4.3	IOC Capacity Development Strategy 2015-2021 - Annexes, Final Version 23 March 2015	IOC/SC-WESTPAC-X/13.18.2
5.5	Recommendation of WESTPAC Advisory Group on the Implementation of Regional Programmes, Projects and Working Groups for May 2012 – May 2015	IOC/SC-WESTPAC-X/13.19
6	Review and Approval of New Programme/Project Proposals	IOC/SC-WESTPAC-X/14
6.1	Development of a Regional Program to Monitor the Ecological Impacts of Ocean Acidification on Coral Reef Ecosystems	IOC/SC-WESTPAC-X/14.1
6.2	Marine Endangered Species (MES) in the Tropical Asia for Effective Conservation	IOC/SC-WESTPAC-X/14.2
6.3	Upwelling Studies through Ocean Data Integration towards Sustaining Ocean Health and Productivity	IOC/SC-WESTPAC-X/14.3
6.4	Indo-Pacific Ocean Environmental Variations and Air-Sea Interactions	IOC/SC-WESTPAC-X/14.4

Agenda Items	Title	Document Code
6.5	Development of the Indo-Pacific Ocean Observations and Services Network (IPON)	IOC/SC-WESTPAC-X/14.5
7	Cooperation with Other Organizations	IOC/SC-WESTPAC-X/15
7.1	Statement of UNEP/Northwest Pacific Action Plan (NOWPAP) on the Cooperation with WESTPAC	IOC/SC-WESTPAC-X/15.1
7.2	Statement of Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) on the Cooperation with WESTPAC	IOC/SC-WESTPAC-X/15.2
7.3	Statement of Bay of Bengal Large Marine Ecosystem Project (BOBLME) on the Cooperation with WESTPAC	IOC/SC-WESTPAC-X/15.3
7.4	Statement of Climate and Ocean: Variability, Predictability, and Change (CLIVAR) on the cooperation with WESTPAC	IOC/SC-WESTPAC-X/15.4
8	WESTPAC Programme and Budget for May 2015 – May 2017	IOC/SC-WESTPAC-X/16
9.1	Elections of the Officers of the Sub-Commission	IOC/SC-WESTPAC-X/17
9.1	Election Procedures and Forms	IOC/SC-WESTPAC-X/17.1
9.1	List of Chair and Vice-Chairpersons of the IOC Sub-Commission for the Western Pacific (WESTPAC)	IOC/SC-WESTPAC-X/17.2
10	List of Venues and Dates for WESTPAC Intergovernmental Sessions	IOC/SC-WESTPAC-X/18

Information Documents

--	Information Note for Participants	IOC/SC-WESTPAC-X/inf.1
--	List of Participants	IOC/SC-WESTPAC-X/inf.2
--	IOC Circular Letter No. 2556	IOC/SC-WESTPAC-X/inf.3
All	Summary Report of the Ninth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-IX), Busan, Republic of Korea, 9-12 May 2012	IOC/SC-WESTPAC-X/inf.4
All	Executive Summary of the Ninth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-IX), Busan, Republic of Korea, 9-	IOC/SC-WESTPAC-X/inf.5

Agenda Items	Title	Document Code
	12 May 2012	
All	Summary Report of the Eighth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VIII), Bali, Indonesia, 10-13 May 2010	IOC/SC-WESTPAC-X/inf.6
All	Executive Summary of the Eighth Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VIII), Bali, Indonesia, 10-13 May 2010	IOC/SC-WESTPAC-X/inf.7
All	Summary Report of the Seventh Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26-29 May 2008	IOC/SC-WESTPAC-X/inf.8
All	Executive Summary of the Seventh Intergovernmental Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26-29 May 2008	IOC/SC-WESTPAC-X/inf.9
3.3	IOC Medium-Term Strategy, 2014-2021	IOC/SC-WESTPAC-X/inf.10
3.3	Programme and Budget for 2014-2017 and Workplan 2014-2015	IOC/SC-WESTPAC-X/inf.11
4.1	WESTPAC Flyer on Highlights of WESTPAC's 25th Anniversary	IOC/SC-WESTPAC-X/inf.12
4.2	WESTPAC Flyer on WESTPAC 9th International Scientific Symposium "A Healthy Ocean for Prosperity in the Western Pacific: Scientific Challenges and Possible Solutions", 22-25 April 2014, Nha Trang Vietnam	IOC/SC-WESTPAC-X/inf.13
4.4	WESTPAC Flyer on WESTPAC Approach to Capacity Development in Marine Science	IOC/SC-WESTPAC-X/inf.14

ANNEX V

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ANNEX VI

LIST OF ACRONYMS

ABS	Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity
ADOES	Asian Dust and its Impact on Ocean Ecosystem
AG	WESTPAC Advisory Group
ASEAN	Association of Southeast Asian Nations
BBNJ	Conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction
CSK	Cooperative Study of the Kuroshio and Adjacent Regions
CTI	Coral Triangle Initiatives
DMCR	Department of Marine and Coastal Resources, Thailand
DRMREEF	DNA Taxonomy and Recruitment Monitoring of the Coral Reef Marine Organisms
EAS	East Asian Seas
FAO/BOBLME	Food and Agriculture Organization of the United Nations/Bay of Bengal Large Marine Ecosystem Project
FIO	First Institute of Oceanography
GAIA	Western Pacific Equatorial Time Series Observation
GOA-OA	Global Ocean Acidification Observing Network
GOOS	Global Ocean Observing System
HAB	Harmful Algal Blooms
IIOE	International Indian Ocean Expedition
IndOOS	Indian Ocean Observing System
IOC	Intergovernmental Oceanographic Commission
IOCAFRICA	IOC Sub-Commission for Africa and Adjacent Island States
IOCCP	International Ocean Carbon Coordination Project
IODE	International Oceanographic Data and Information Exchange
IOGOOS	Indian Ocean GOOS
IOTWS	Indian Ocean Tsunami Warning and Mitigation System
IPOVAI	Indo-Pacific Ocean Environmental Variations and Air-sea Interactions
ISSC	International Scientific Steering Committee
ITF	Indonesian Through Flow
JCOMM	Joint IOC-WMO Technical Commission for Oceanography and Marine Meteorology
LCs	Learning Centers
LME	Large Marine Ecosystem
MESTA	Regional Study of Marine Endangered Species (Mammals and Sea Turtles) in the Tropical Asia for Effective Conservation
MOMSEI	Monsoon Onset Monitoring over Andaman Sea and its Social and Ecosystem Impacts
MRET	Marine Renewable Energy Technology Development
NEARGOOS	North East Asian Regional GOOS
NPOCE	Northwestern Pacific Ocean Circulation and Climate Experiment
OBIS	Ocean Biogeographic Information System
ODINWESTPAC	Ocean Data and Information Network for the Western Pacific Region
OFDS	Ocean Forecasting Demonstration System
OFS	Ocean Forecasting System
OSJ	Ocean Science Journal
OTGA	IODE's Ocean Teacher Global Academy
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia

POSEIDON	Northwestern Pacific Ocean Study on Environment and Interactions between Deep Ocean and Marginal Seas
RAMA	Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction
Regular Process	World Ocean Assessment
RCOE	Regional Centers of Excellence
RTRCs	IOC Regional Network of Training and Research Centers on Marine Science
RTRC-ODC	IOC Regional Training and Research Center on Ocean Dynamics and Climate
RTCs	Regional Training Centers
SC-IPON	Scientific Steering Committee for the Indo-Pacific Ocean Observation Network
SDS-SEA	Sustainable Development Strategy for the Seas of East Asia
SEA	Southeast Asian
SEAGOOS	South East Asian Global Observing System
SIDS	Small Island Developing States
SOA	State Ocean Administration, China
TAO-TRITON	Tropical Atmosphere Ocean/Triangle Trans-Ocean Buoy Network
TEMA	IOC Training, Education and Mutual Assistance Programme
TPOS	Tropical Pacific Observing System
UNEP/NOWPAP	United Nations Environment Programme/Northwest Pacific Action Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
VAST	Vietnam Academy of Science and Technology
WCRP/CLIVAR	World Climate Research Program/Climate Variability and Predictability
WESTPAC	IOC Sub-Commission for the Western Pacific
WESTPAC Office	IOC Regional Office for the Western Pacific
WMO	World Meteorological Organization
YMC	Year of Maritime Continent

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2. Seventeenth Session of the Executive Council	E, F, S, R, Ar
3. Fourth Session of the Working Committee for Training, Education and Mutual Assistance	E, F, S, R
4. Fifth Session of the Working Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S, R
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11. Nineteenth Session of the Executive Council, Paris, 1986	E, F, S, R, Ar
12. Sixth Session of the IOC Scientific Committee for the Global Investigation of Pollution in the Marine Environment	E, F, S
13. Twelfth Session of the IOC Working Committee on International Oceanographic Data Exchange	E, F, S, R
14. Second Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Havana, 1986	E, F, S
15. First Session of the IOC Regional Committee for the Central Eastern Atlantic, Praia, 1987	E, F, S
16. Second Session of the IOC Programme Group on Ocean Processes and Climate	E, F, S
17. Twentieth Session of the Executive Council, Paris, 1987	E, F, S, R, Ar
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19. Fifth Session of the IOC Regional Committee for the Southern Ocean	E, F, S, R
20. Eleventh Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Beijing, 1987	E, F, S, R
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24. Twenty-second Session of the Executive Council, Paris, 1989	E, F, S, R
25. Fifteenth Session of the Assembly, Paris, 1989	E, F, S, R
26. Third Session of the IOC Committee on Ocean Processes and Climate, Paris, 1989	E, F, S, R
27. Twelfth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Novosibirski, 1989	E, F, S, R
28. Third Session of the Sub-Commission for the Caribbean and Adjacent Regions, Caracas, 1989	E, S
29. First Session of the IOC Sub-Commission for the Western Pacific, Hangzhou, 1990	E only
30. Fifth Session of the IOC Regional Committee for the Western Pacific, Hangzhou, 1990	E only
31. Twenty-third Session of the Executive Council, Paris, 1990	E, F, S, R
32. Thirteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, New York, 1990	E only
33. Seventh Session of the IOC Committee for the Global Investigation of Pollution in the Marine Environment, Paris, 1991	E, F, S, R
34. Fifth Session of the IOC Committee for Training, Education and Mutual Assistance in Marine Sciences, Paris, 1991	E, F, S, R
35. Fourth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1991	E, F, S, R
36. Twenty-fourth Session of the Executive Council, Paris, 1991	E, F, S, R
37. Sixteenth Session of the Assembly, Paris, 1991	E, F, S, R, Ar
38. Thirteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Baja California, 1991	E, F, S, R
39. Second Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1992	E only
40. Twenty-fifth Session of the Executive Council, Paris, 1992	E, F, S, R
41. Fifth Session of the IOC Committee on Ocean Processes and Climate, Paris, 1992	E, F, S, R
42. Second Session of the IOC Regional Committee for the Central Eastern Atlantic, Lagos, 1990	E, F
43. First Session of the Joint IOC-UNEP Intergovernmental Panel for the Global Investigation of Pollution in the Marine Environment, Paris, 1992	E, F, S, R
44. First Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1992	E, F, S
45. Fourteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 1992	E, F, S, R
46. Third Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Vascoas, 1992	E, F
47. Second Session of the IOC Sub-Commission for the Western Pacific, Bangkok, 1993	E only
48. Fourth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Veracruz, 1992	E, S
49. Third Session of the IOC Regional Committee for the Central Eastern Atlantic, Dakar, 1993	E, F
50. First Session of the IOC Committee for the Global Ocean Observing System, Paris, 1993	E, F, S, R
51. Twenty-sixth Session of the Executive Council, Paris, 1993	E, F, S, R
52. Seventeenth Session of the Assembly, Paris, 1993	E, F, S, R
53. Fourteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Tokyo, 1993	E, F, S, R
54. Second Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1993	E, F, S
55. Twenty-seventh Session of the Executive Council, Paris, 1994	E, F, S, R
56. First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Melbourne, 1994	E, F, S, R
57. Eighth Session of the IOC-UNEP-IMO Committee for the Global Investigation of Pollution in the Marine Environment, San José, Costa Rica, 1994	E, F, S
58. Twenty-eighth Session of the Executive Council, Paris, 1995	E, F, S, R
59. Eighteenth Session of the Assembly, Paris, 1995	E, F, S, R
60. Second Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E, F, S, R

61.	Third Session of the IOC-WMO Intergovernmental WOCE Panel, Paris, 1995	E only
62.	Fifteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Papete, 1995	E, F, S, R
63.	Third Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1995	E, F, S
64.	Fifteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange	E, F, S, R
65.	Second Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E only
66.	Third Session of the IOC Sub-Commission for the Western Pacific, Tokyo, 1996	E only
67.	Fifth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, Christ Church, 1995	E, S
68.	Intergovernmental Meeting on the IOC Black Sea Regional Programme in Marine Sciences and Services	E, R
69.	Fourth Session of the IOC Regional Committee for the Central Eastern Atlantic, Las Palmas, 1995	E, F, S
70.	Twenty-ninth Session of the Executive Council, Paris, 1996	E, F, S, R
71.	Sixth Session for the IOC Regional Committee for the Southern Ocean and the First Southern Ocean Forum, Bremerhaven, 1996	E, F, S,
72.	IOC Black Sea Regional Committee, First Session, Varna, 1996	E, R
73.	IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Fourth Session, Mombasa, 1997	E, F
74.	Nineteenth Session of the Assembly, Paris, 1997	E, F, S, R
75.	Third Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1997	E, F, S, R
76.	Thirtieth Session of the Executive Council, Paris, 1997	E, F, S, R
77.	Second Session of the IOC Regional Committee for the Central Indian Ocean, Goa, 1996	E only
78.	Sixteenth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Lima, 1997	E, F, S, R
79.	Thirty-first Session of the Executive Council, Paris, 1998	E, F, S, R
80.	Thirty-second Session of the Executive Council, Paris, 1999	E, F, S, R
81.	Second Session of the IOC Black Sea Regional Committee, Istanbul, 1999	E only
82.	Twentieth Session of the Assembly, Paris, 1999	E, F, S, R
83.	Fourth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1999	E, F, S, R
84.	Seventeenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Seoul, 1999	E, F, S, R
85.	Fourth Session of the IOC Sub-Commission for the Western Pacific, Seoul, 1999	E only
86.	Thirty-third Session of the Executive Council, Paris, 2000	E, F, S, R
87.	Thirty-fourth Session of the Executive Council, Paris, 2001	E, F, S, R
88.	Extraordinary Session of the Executive Council, Paris, 2001	E, F, S, R
89.	Sixth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions, San José, 1999	E only
90.	Twenty-first Session of the Assembly, Paris, 2001	E, F, S, R
91.	Thirty-fifth Session of the Executive Council, Paris, 2002	E, F, S, R
92.	Sixteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Lisbon, 2000	E, F, S, R
93.	Eighteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Cartagena, 2001	E, F, S, R
94.	Fifth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2001	E, F, S, R
95.	Seventh Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Mexico, 2002	E, S
96.	Fifth Session of the IOC Sub-Commission for the Western Pacific, Australia, 2002	E only
97.	Thirty-sixth Session of the Executive Council, Paris, 2003	E, F, S, R
98.	Twenty-second Session of the Assembly, Paris, 2003	E, F, S, R
99.	Fifth Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Kenya, 2002 (* Executive Summary available separately in E, F, S & R)	E*
100.	Sixth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, St. Petersburg (USA), 2002 (* Executive Summary available separately in E, F, S & R)	E*
101.	Seventeenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
102.	Sixth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
103.	Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Wellington, New Zealand, 2003 (* Executive Summary available separately in E, F, S & R)	E*
104.	Third Session of the IOC Regional Committee for the Central Indian Ocean, Tehran, Islamic Republic of Iran, 21-23 February 2000	E only
105.	Thirty-seventh Session of the Executive Council, Paris, 2004	E, F, S, R
106.	Seventh Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2005 (* Executive Summary available separately in E, F, S & R); and Extraordinary Session, Paris, 20 June 2005	E*
107.	First Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Perth, Australia, 3-5 August 2005	E only
108.	Twentieth Session of the Intergovernmental Coordination Group for the Tsunami Warning System in the Pacific, Viña del Mar, Chile, 3-7 October 2005 (* Executive Summary available separately in E, F, S & R)	E*
109.	Twenty-Third Session of the Assembly, Paris, 21-30 June 2005	E, F, S, R
110.	First Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Rome, Italy, 21-22 November 2005	E only
111.	Eighth Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14-17 April 2004 (* Executive Summary available separately in E, F, S & R)	E*
112.	First Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (ICG/CARIBE-EWS), Bridgetown, Barbados, 10-12 January 2006	E only
113.	Ninth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Cartagena de Indias, Colombia, 19-22 April 2006 (* Executive Summary available separately in E, F, S & R)	E S*

114.	Second Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Hyderabad, India, 14–16 December 2005	E only
115.	Second Session of the WMO-IOC Joint Technical Commission for Oceanography and Marine Meteorology, Halifax, Canada, 19–27 September 2005 (Abridged final report with resolutions and recommendations)	E, F, R, S
116.	Sixth Session of the IOC Regional Committee for the Western Indian Ocean (IOCWIO), Maputo, Mozambique, 2–4 November 2005 (* Executive Summary available separately in E, F, S & R)	E*
117.	Fourth Session of the IOC Regional Committee for the Central Indian Ocean, Colombo, Sri Lanka 8–10 December 2005 (* Executive Summary available separately in E, F, S & R)	E*
118.	Thirty-eighth Session of the Executive Council, Paris, 20 June 2005 (Electronic copy only)	E, F, R, S
119.	Thirty-ninth Session of the Executive Council, Paris, 21–28 June 2006	E, F, R, S
120.	Third Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Bali, Indonesia, 31 July–2 August 2006 (*Executive Summary available separately in E,F,S & R)	E*
121.	Second Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Nice, France, 22–24 May 2006	E only
122.	Seventh Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 16–18 March 2005 (* Executive Summary available separately in E, F, S & R)	E*
123.	Fourth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS-IV), Mombasa, Kenya, 30 February-2 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
124.	Nineteenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Trieste, Italy, 12–16 March 2007 (* Executive Summary available separately in E, F, S & R)	E*
125.	Third Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Bonn, Germany, 7–9 February 2007 (* Executive Summary available separately in E, F, S & R)	E*
126.	Second Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Cumaná, Venezuela, 15–19 January 2007 (* Executive Summary available separately in E, F, S & R)	E*
127.	Twenty-first Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Melbourne, Australia, 3–5 May 2006 (* Executive Summary available separately in E, F, S & R)	E*
128.	Twenty-fourth Session of the Assembly, Paris, 19–28 June 2007	E, F, S, R
129.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Lisbon, Portugal, 21–23 November 2007 (* Executive Summary available separately in E, F, S & R)	E*
130.	Twenty-second Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Guayaquil, Ecuador, 17–21 September 2007 (* Executive Summary available in E, F, S & R included)	E*
131.	Forty-first Session of the Executive Council, Paris, 24 June–1 July 2008	E, F, R, S
132.	Third Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Panama City, Panama, 12–14 March 2008 (* Executive Summary available separately in E, F, S & R)	E*
133.	Eighth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 17–20 April 2007 (* Executive Summary available separately in E, F, S & R)	E*
134.	Twenty-third Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Apia, Samoa, 16–18 February 2009 (*Executive Summary available separately in E, F, S & R)	E*
135.	Twentieth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Beijing, China, 4–8 May 2009 (*Executive Summary available separately in E, F, S & R)	E*
136.	Tenth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Puerto La Cruz, Bolivarian Republic of Venezuela, 22–25 October 2008 (*Executive Summary available separately in E, F, S & R)	E, S*
137.	Seventh Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VII), Sabah, Malaysia, 26–29 May 2008 (*Executive Summary available separately in E, F, S & R)	E*
138.	Ninth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, France, 10–12 June 2009 (* Executive Summary available separately in E, F, S & R);	E*
139.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Athens, Greece, 3–5 November 2008 (* Executive Summary available separately in E, F, S & R)	E*
140.	Fourth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Fort-de-France, Martinique, France, 2–4 June 2009 (* Executive Summary available separately in E, F, S & R)	E*
141.	Twenty-fifth Session of the Assembly, Paris, 16–25 June 2009	E, F, R, S
142.	Third Session of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology, Marrakesh, Morocco, 4–11 November 2009	E, F, R, S
143.	Ninth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 22–24 April 2009 (* Executive Summary available separately in E, F, S & R)	E*
144.	Fifth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Managua, Nicaragua, 15–17 March 2010 (* Executive Summary available in E, F, S & R)	E*
145.	Sixth Session of the IOC Regional Committee for the Central and Eastern Atlantic Ocean, Accra, Ghana, 28–30 March 2010 (* Executive Summary available in E, F, S & R)	E*
146.	Forty-second Session of the Executive Council; Paris, 15, 19 & 20 June 2009	E, F, R, S
147.	Forty-third Session of the Executive Council; Paris, 8–16 June 2010	E, F, R, S
148.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Istanbul, Turkey, 11–13 November 2009 (* Executive Summary available separately in Ar, E, F, S & R)	E*
149.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, Paris, France, 23–25 November 2010 (* Executive Summary available separately in Ar, E, F, S & R)	E*
150.	Sixth Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Santo Domingo, Dominican Republic, 26–29 April 2011 (* Executive Summary available in E, F, S & R)	E*

151.	Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Beijing, China, 24–27 May 2011 (*Executive Summary in E, F, S & R included)	E*
152.	Twenty-first Session of the IOC Committee on International Oceanographic Data and Information Exchange, Liège, Belgium, 23–26 March 2011 (*Executive Summary available separately in E, F, S & R)	E*
153.	Eighth Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VIII), Bali, Indonesia, 10–13 May 2010 (*Executive Summary available separately in E, F, S & R)	E*
154.	Tenth IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 12–14 April 2011 (* Executive Summary available separately in E, F, S & R)	E*
155.	Forty-fifth Session of the Executive Council, Paris, 26–28 June 2012 (* Decisions available in E, F, S & R)	E*
156.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Willemstad, Curacao, 2–4 April 2012 (*Executive Summary available in E, F, S & R)	E*
157.	Eleventh Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Miami, USA, 17–20 May 2011 (*Executive Summary available separately in E & S)	E, S*
158.	Eight Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-VIII), Trinidad & Tobago, 29 April–1 May 2013 (*Executive Summary available in E, F, S & R)	E*
159.	Twenty-seventh Session of the Assembly, Paris, 26 June–5 July 2013 and Forty-sixth Session of the Executive Council, Paris, 25 June 2013	E, F, R, S
160.	Twenty-fifth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS), Vladivostok, Russian Federation, 9–11 September 2013 (*Executive Summary in E, F & R)	E*
161.	Ninth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions, US Virgin Islands, 13–15 May 2014 (*Executive Summary available in E, F, S & R)	E*
162.	Forty-seventh Session of the Executive Council, Paris, 1–4 July 2014 (* Decisions available in E, F, S & R)	E*
163.	Ninth Session of the IOC Sub-Commission of the Western Pacific (WESTPAC-IX), Busan, Republic of Korea, 9–12 May 2012	E
164.	Eleventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, 12–14 November 2014, Nicosia, Cyprus (*Executive Summary available in E, F, S & R)	E*
165.	Twenty-sixth Session of the Intergovernmental Coordination Group for the for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVI), Hawaii, USA, 22–24 April 2015 (*Executive Summary available in E, F, S & R)	E*
166.	Tenth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), Philipsburg, Sint Maarten, Kingdom of the Netherlands, 19–21 May 2015 (*Executive Summary available in E, F, S & R)	E*
167.	Tenth Session of the IOC Sub-Commission of the Western Pacific (WESTPAC-X), Phuket, Thailand, 12–15 May 2015	E