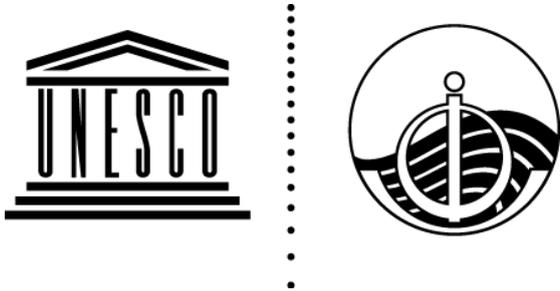


Intergovernmental Oceanographic Commission
Reports of Meetings of Experts and Equivalent Bodies



**Regional Working Group on
Tsunami Warning and Mitigation
System for the South China Sea
Region (WG-SCS)**

Twelfth Meeting
Jakarta, Indonesia
7 and 8 November 2024

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UNESCO 2025

ICG/PTWS-WG-SCS-XII/3

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1. WELCOME AND OPENING

The Twelfth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS-XII) was held on 7 and 8 November 2024 in Jakarta, Indonesia.

Ms Suci Dewi Anugrah, Chair of WG-SCS, opened the meeting and welcomed participants from China, Indonesia, Malaysia, Philippine, Viet Nam (attending online), and the Secretariat (Dr Öcal Necmioğlu). She thanked to all the members of the WG-SCS for their continued support to strengthen the Tsunami Warning and Mitigation System in the South China Sea Region. He reminded the aim of the meeting was to review all the achievements and activities which had been conducted during the intersessional period and to be followed up with a plan of concrete actions. She congratulated the Task Team of Capacity Development for their continued effort in conducting the valuable activities including training and the International Staff Program in order to enhance the capacity of the Member States of the WG-SCS. She reminded the next upcoming important event, the 31st Session of the ICG/PTWS on 7-11 April 2025, in Beijing, China, and expressed her hopes that the WG-SCS-XII could result in good outcomes that could be shared in the next ICG/PTWS Session.

Dr Wahyu Pandoe, Executive Director for Indonesian National Committee of IOC-UNESCO, expressed his warm welcome to all participants and recalled that the meeting was the third time venues hosted in Indonesia, and the Agency for Meteorology, Climatology, and Geophysics (BMKG) was very pleased and honored to host this meeting. If allowed, future meeting could be arranged in another city in Indonesia. He expected that the WG-SCS could contribute to global commitment such as in UN Ocean Decade and Early Warnings for All (EW4All) initiative and promote early actions. He added that he expected WG-SCS to provide inputs to strengthening Tsunami Early Warning System globally. He encouraged to increase collaboration and coordination among member states and hopes that some more member states would be joining in the near future.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF AGENDA

Ms Suci Dewi Anugrah, acknowledged the participants the provisional agenda that had been circulated before the meeting. The agenda was adopted without changes and is included under [Annex I](#).

2.2 DESIGNATION OF RAPPORTEUR

The Delegation of Indonesia volunteered Mr Gatut Daniarsyad from BMKG to serve as rapporteur and Mr Zongchen Wang from the National Marine Environmental Forecasting Center (NMEFC) to support Mr Gatut Daniarsyad. These recommendations were accepted by the Group.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

The Chair, Ms Anugrah, provided an overview of the schedule of all agenda items as indicated in the provisional timetable. The timetable was adopted as presented. The Chair indicated that all the documents pertinent to the meeting were available at the ICG/PTWS-WG-SCS-XII meeting website.

3. REVIEW OF DECISIONS, RECOMMENDATIONS AND ACTIONS ARISING FROM ICG/PTWS-WG-SCS-XI MEETING AND ICG/PTWS-SC MEETING

The Chair, Ms Anugrah, recalled that ICG/PTWS-WG-SCS-XI was held on 25 and 26

September 2023 in Guangzhou, China and was attended by 15 participants from China, Indonesia, Malaysia, Viet Nam, and the Secretariat.

The Chair also recalled that the previous meeting of the WG-SCS (ICG/PTWS-WG-SCS-XI) decided to continue the ICG/PTWS-WG-SCS and the Task Team on Capacity Development and Services (TT-CDS) with their Terms of Reference remained unchanged as given in [Appendix 1](#) and [Appendix 2](#) to Annex I respectively, and the Chairs and Vice-Chairs to be elected at the Twelfth meeting. The action had been taken and the meeting appointed Ms Suci Dewi Anugrah (Indonesia) as the Chair, and Ms Ching-chi LAM (China) as the Vice-Chair of WG-SCS, Dr Zhigou Xu (China) and Indra Gunawan (Indonesia) as the Chair and Vice-Chair of TT-CDS respectively.

The Chair added that the previous meeting had acknowledged with appreciation the satisfactory performance of the SCSTAC, since its full operation starting on 5 November 2019, and the full operation of the BSCSTAC (Hong Kong) since 29 March 2023.

The Chair also added that ICG/PTWS-WG SCS encouraged the Member States to implement the IOC-UNESCO Tsunami Ready Recognition Programme (TRRP) or similar activities for vulnerable communities, to meet the UN Ocean Decade Tsunami Programme goal of 100% at-risk communities resilient and prepared for tsunamis by 2030, and to actively contribute to the activities of the ICG/PTWS WG3 Task Team on Tsunami Ready established at the thirtieth Session of the ICG/PTWS in Tonga, 2023. The Chair mentioned that some actions had been taken following this recommendation; those are: (i) promoting the TRRP at the 11th meeting of WG-SCS; (ii) plan to conduct online and offline training of the Tsunami Ready coordinated by the TT-CDS; and (iii) plan to pilot the TRRP in the SCS region.

The Chair continued to recall that the WG-SCS recognized the paucity of seismic and sea level stations close to the major tsunami sources within the SCS region available to the South China Sea Tsunami Warning and Mitigation System, and encouraged the Member States of the WG-SCS to share more seismic and sea level stations for tsunami warning purposes in accordance with the IOC Oceanographic Data Exchange Policy to further enhance the tsunami warning capability in the South China Sea region, especially for the Sulu Sea, Celebes Sea and North Borneo.

The Chair added information of the International Secondment Program with full funding by hosting three experts from WG-SCS Member States from July to September 2023 for a two-month period. The experts were Mr Mohammad Obie Restianto from BMKG of Indonesia, Mr Bhenz Rodriguez from PHIVOLCS of The Philippines, and Mr Yip Weng Sang from MMD of Malaysia.

The Chair reminded the Member States of the WG-SCS to regularly update information on National Tsunami Warning Center (NTWC), Tsunami National Contacts (TNC) and Tsunami Warning Focal Points (TWFP) with IOC Secretariat following the established procedures, and further encouraged the Member States to make use of centralized/institutional e-mail addresses as an internal e-mail list to efficiently accommodate changes to the responsible persons for receiving tsunami messages.

The Chair recalled the participation of the WG-SCS in the ICG/PTWS activities, those are: (i) taking active participation in the ITIC Training Program in Hawaii in 2023; (ii) attended the ICG/PTWS-XXX hosted by Tonga in 2023; and (iii) attended the SC of the ICG/PTWS in Hawaii, September 2024.

The Chair reminded the possibility of Malaysia for hosting the Thirteenth Meeting of the WG-SCS in 2025, also the possibility of China to host the Fourteenth Meeting of the WG-SCS in 2026 in Hong Kong.

4. REPORTS

4.1 NATIONAL PROGRESS REPORTS

4.1.1. China

Mr Zongchen Wang, National Marine Environmental Forecasting Centre (NMEFC), Ministry of Natural Resources (MNR) of the People's Republic of China, presented the report of China. He reported that their global seismic data network consists of nearly 800 broadband seismic stations, with the multiple sources including the MNR, China Earthquake Administration (CEA) and globally shared seismic data server. The main seismic data processing software are SeisComP, the self-developed Global Earthquake Detection and Location System (GEDLS) and the Earthquake Instant Messaging (EQIM) imported from CEA. The Antelope results, as well as earthquake parameters from USGS and PTWC are used to calibrate the first determination, because they are relatively slow.

The global sea-level monitoring system comprises nearly 600 functional tidal gauges and DART buoys via GTS as well as data from sea-level monitoring facility website. In addition, NMEFC receives real-time sea-level data from more than 150 tidal gauges along the coast of China. Five of them are involved in international sharing via GTS for the tsunami warning and mitigation system in the SCS region, three from the Chinese mainland and two from Hong Kong.

Two sets of tsunami database are in use for tsunami hazard analysis along the coast of China and over the SCS region, namely the NW Pacific Scenario Database (NWPSD) covering the Northwest Pacific and the Pacific Unit Source Database (PUSD) covering the Pacific Ocean. On-the-fly tsunami forecast model with the GPU accelerator was capable of producing a Pacific tsunami forecast within 45 seconds. In the Northwest Pacific and SCS region, the respective model run can be completed in less than 5 seconds. Besides, the numerical tsunami forecast model has covered the Indian Ocean, North Atlantic Ocean, Mediterranean Sea, and Caribbean for domestic users and stakeholders.

A Smart Tsunami Information Processing System (STIPS) has been developed to serve as a tsunami warning and decision support system in China and adopted in SCSTAC and BSCSTAC operation. It was developed by Mr Hongwei Li of NMEFC in Python language. STIPS was put into operation in 2022. Progress would be introduced under agenda item 6. The former decision supporting system is stand-by, with a low-cost maintenance in case of unexpected malfunction of STIPS. A Lightweight DSS based on STIPS has been developed and used in Hong Kong and Macao.

The main operation platform is located at 8 Dahuisi Road, Haidian District, Beijing. The backup platform is located at Huairou District, Beijing, about 66 km away from the main platform. It can be connected with VPN based on independent network card and standby battery power. From October 2023 to October 2024, NTWC responded to 39 major earthquakes, and 66 information bulletins and 8 threat bulletins were issued with an average latency of 9.7 minutes for the initial message. At 7:58 (BJT) on 3 April 2024, a 7.3-magnitude earthquake occurred off the west coast of Taiwan, China, with a focal depth of 12.0 kilometers. An Orange Alert for potential tsunami hazards was issued with the latency of about 12 minutes for the first bulletin. Hualien station reported a 105-centimeter tsunami amplitude.

On 5 November 2024, PacWave 2024 was conducted by kicking off the communication test message in the South China Sea region. In addition, with the assumption of a magnitude 9.0 earthquake occurring in the Nankai Trough, a tsunami would be triggered, and severely impact the coasts of China. Orange Alerts were released to the corresponding provincial marine disaster forecast and service agency. A tsunami risk assessment was conducted for Macao.

Mr Zongchen Wang briefed on the coordination, training, workshop and visiting activities involved by NTWC in 2024. He emphasized their joint workshop and corporation on numerical model forecast and training with STMKG-BMKG and Bangladesh Meteorological Department under the bilateral agreements.

Dr Necmioğlu asked whether the IOC Circular Letter not being released for PacWave-2024 within the timeline as proposed by the ICG/PTWS XXX had any impact on the exercise. China responded that, so far, NMEFC had not observed any negative impacts but would further evaluate the situation according to the feedback from the communication test. Indonesia asked if the NTWC of China used cable detectors for the tsunami system, and China responded that they did not.

4.1.2. Indonesia

Mr Gatut Daniarsyad from BMKG, presented the National Report of Indonesia. He overviewed the Indonesia's seismic activity, tsunami early warning system, and disaster preparedness initiatives. He recalled the location of the country at the junction of four active tectonic plates, making Indonesia highly vulnerable to earthquakes and tsunamis, and hence its early warning system (InaTEWS) is crucial for disaster risk reduction.

He reported the progress of the monitoring system and there are currently 533 seismic stations, 211 tide gauges, and various tsunami monitoring sensors, including tsunami buoys and automatic water level recorders. In addition, the InaTEWS is currently able to disseminate earthquake and tsunami warnings within three minutes. The tsunami warning is produced by TOAST (Tsunami Observation and Simulation Terminal) system which has over 22,000 tsunami scenarios to enhance prediction accuracy.

Mr Gatut briefed on the policy that strengthened the InaTEWS by Presidential Decree No. 93 (2019), and reinforced the development of the Earthquake and Tsunami Early Warning System (InaTEWS). BMKG serves as the focal point for earthquake and tsunami warnings, while the National Disaster Management Agency in Indonesia, BNPB, manages disaster preparedness and mitigation at the community level.

Regarding the mitigation of earthquake and tsunami, BMKG organised a Field School of Earthquake to strengthen local government and community resilience. Through the scheme "BMKG Goes to School (BGTS)", BMKG initiative is to educate students and teachers on earthquake and tsunami preparedness. BMKG is also actively piloting UNESCO IOC's "Tsunami Ready" recognition for 10 communities, advocating for compliance with international preparedness standards.

Mr Gatut presented the development of dissemination system for InaTEWS. He noted that BMKG utilizes multi-platform dissemination, including social media (@infoBMKG with millions of followers), mobile applications, and interactive media for rapid information sharing. He also briefed that the continuous digital transformation of Multi-Hazard Early Warning Systems (EWS) ensures better accessibility and public awareness.

Mr Gatut also mentioned the recommendations regarding the need to enhance real-time data accuracy by integrating AI and machine learning to improve real-time earthquake and tsunami prediction accuracy. While BMKG has made great strides in public education, he recommended expanding community-based preparedness into rural and high-risk coastal areas to further strengthen local readiness. Additionally, given Indonesia's central location in the Pacific Ring of Fire, strengthening international collaboration through closer regional coordination with neighbouring countries could enhance tsunami forecasting and response strategies.

Mr Gatut concluded that Indonesia's InaTEWS is one of the most advanced tsunami early warning systems in the world, leveraging cutting-edge technology, comprehensive policies, and community-driven preparedness initiatives. The rapid dissemination of warnings, strong governmental support, and digital transformation efforts have significantly improved the country's disaster response capabilities. Moving forward, expanding public engagement, enhancing real-time prediction accuracy, and fostering international collaboration will be essential for further strengthening Indonesia's tsunami resilience.

China asked how to preserve the rapid response of the analyst when Indonesia faces a very fast tsunami arrival. Indonesia responded that the automatic response is the key, but they still need to verify it. The operator in the TOAST checked and confirmed that earthquake dissemination within three minutes is sufficient and can be managed. China also asked how many stations Indonesia used. Indonesia responded that they shared 21 stations with GEOFON and 14 stations with Guangdong, and dismantled 2. Most stations are broadband, with strong motion collocated, used only for Shakemap and early warning.

Dr Necmioğlu mentioned that additional triggers, such as sirens, are needed for evacuation and asked how the increase in stations relates to seismicity, as well as about IDSL. Indonesia responded that in recent years they have seen more earthquakes and planned to investigate the relationship with seismicity rates. Indonesia mentioned that IDSL is managed by the Fisheries Ministry, and InaTNT aims to integrate different systems. As the NT Earthquake is tricky and unpredictable, sensors and AWS should be placed as close as possible, such as near Krakatau. They currently have 11 IDSLs and plan to install 100 tsunami gauges with BIG, along with CCTV for better monitoring.

Dr Villegas suggested that it is necessary to identify which volcanoes need to be monitored. Indonesia responded that they agreed on the importance of this and noted that PVMBG provides the relevant information. In addition, Indonesia mentioned the need for a high sampling rate with a frequency higher than 1 Hz. They also mentioned experimenting with primary and secondary waves and they needed to proceed with spectral analysis. They stated that reporting should use a high sampling rate and details could be provided later, as it is still in development and installed on cable sensors.

4.1.3. Malaysia

Mr Zaidi Bin Zainal Abidin from the Malaysian Meteorological Department (MMD) presented the national progress report Malaysia which provided a comprehensive overview of Malaysia's Tsunami Early Warning System (SAATNM) and its continuous advancements since its establishment in 2005.

He introduced the highlight of the country's commitment to ensuring effective and rapid early warning dissemination to protect the public from potential tsunami threats in the Indian Ocean, South China Sea, Sulu Sea, and the Pacific Ocean. Malaysia operates 80 seismic stations, with 42 located in the Peninsula, 28 in Sabah, and 10 in Sarawak, all providing real-time earthquake data. In addition, data are collected from 25 tide gauges and coastal camera systems. A nationwide network of 83 tsunami sirens has been established to ensure timely public alerts.

To enhance tsunami risk assessment, Met Malaysia's Tsunami Simulation Model is capable of modelling worst-case scenarios, including earthquakes of magnitude 8.5 in the Sulu Sea and Sulawesi Sea, as well as magnitude 9.5 in the Indian Ocean. Moreover, the Tohoku University's Numerical Analysis Model (TUNAMI-F1) is employed for in-depth tsunami behavior prediction.

Mr Zainal Abidin also mentioned the efficiency of information dissemination, where public notifications on earthquake and tsunami threats are promptly issued through national agencies

and online platforms. Past seismic events, including those in Japan, the Nicobar Islands, and Sabah, were effectively monitored and evaluated, ensuring that no false alarms were issued.

In terms of policy enhancements and disaster management, Mr Zainal Abidin noted the transition from NSC Directive No. 20 to the newly introduced NADMA Directive No. 1, which aims to establish a more comprehensive disaster risk management strategy. The new directive is designed to eliminate redundancy, prevent conflicts between agencies, and improve response coordination at all levels of government.

Mr Zainal Abidin emphasized the need to raise public awareness and education about tsunamis. Even though Malaysia has an advanced tsunami warning system, he noted that more community engagement and preparedness initiatives could enhance public understanding of tsunami risks. He also pointed out the importance of technological advancements, such as integrating AI-based predictive analytics or machine learning could improve early detection and risk assessment. Furthermore, for stronger international cooperation, working more closely with neighbouring countries is necessary to enhance information sharing and disaster preparedness across borders.

He provided the conclusion, stating that Malaysia's National Tsunami Early Warning System (SAATNM) has made significant progress in monitoring, preparedness, and disaster risk reduction. The system's infrastructure is well-developed, and the adoption of NADMA Directive No. 1 is a commendable step toward more efficient disaster management. Moving forward, he emphasized that the country could further enhance technological integration and community preparedness to ensure a more resilient tsunami warning system.

4.1.4. The Philippines

Dr Ma Mylene Martinez Villegas from the Philippine Institute of Volcanology and Seismology presented the national report of The Philippines which provided a comprehensive overview of The Philippines Tsunami Early Warning System and its continuous advancements.

She introduced that the Philippines is tsunami prone area which is categorized in 3 types: 1) Prone to trench related distant tsunami; 2) Prone to trench related local tsunami; 3) Prone to offshore fault and submarine landslide related local tsunami. Based on The Philippines earthquake catalogue from 1828 to 2012, The Philippines has been hit by tsunamis 5 times. In 2012/2013, The Philippines has developed a database for 30,000 tsunami scenarios. In 2024, The Philippines has 121 seismographs (30 manned seismic stations, 91 unmanned seismic stations with satellite telemetry communication, 6 volcano-seismic stations with satellite telemetry), 24 real-time tide gauges, 10 community tsunami detection and warning systems, 87 community tsunami alerting stations (sirens), and 29 sea level monitoring stations.

To enhance preparedness capacity, the Philippines socializes the education material (print, digital, video, YouTube). The Philippines also conducts seminars, drills, press conferences, and media program routinely.

4.2 REPORT FROM SCSTAC

Dr Zhiguo Xu presented a report on the performance of the South China Sea Tsunami Advisory Center (SCSTAC). From September 2023 to November 2024, the Center responded to 12 earthquakes with a magnitude of 6.0 or higher within its service area. Most of these earthquakes were located in eastern Taiwan, China and southeastern Indonesia. The largest earthquake, with a magnitude of 7.3, occurred in Taiwan, China and resulted in a maximum tsunami wave of 1m. During this time, all key performance indicators of the Center met their target values. Additionally, the Center conducted quarterly communication tests and participated in the PACWAVE24 international tsunami exercise as required. In order to improve its tsunami warning capabilities, the Center updated and upgraded its Smart Tsunami Information Processing System,

upgraded its global earthquake automatic detection and positioning system, and developed a GTS sea level data decoding and processing module. In terms of international cooperation, the Center held two earthquake and tsunami training courses, recruited three international staff from Indonesia, The Philippines, and Malaysia for study and exchange, successfully organised the 11th ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS-XI) in Guangzhou, China and conducted technical exchange activities related to international tsunami warning in various countries and regions. The Center also received officials from the tsunami warning departments of the IOC and the Solomon Islands for a visit. Moving forward, the Center will continue to ensure the stable operation of the SCS tsunami warning and disaster reduction system, carry out international staff projects, hold tsunami warning technology training courses, and enhance regional tsunami warning capabilities.

4.3 REPORT FROM BSCSTAC (HONG KONG)

Ms. Ching-chi Lam from the Hong Kong Observatory (HKO) presented the report on the operation of the Backup South China Sea Tsunami Advisory Center (Hong Kong) (BSCSTAC).

She recalled that the BSCSTAC was officially launched on 29 March 2023 and had since been operating around the clock in a hot standby mode. It underwent scheduled activation for two weeks in December at the beginning stage as pre-agreed with SCSTAC. A communication test was performed before the scheduled activation. When in hot standby mode, the BSCSTAC watchstander at HKO responded to earthquakes within the Area of Service and followed SOP to prepare advisory products for dissemination to an internal site via Intranet for record and evaluation. Moreover, the watchstander conducted system check twice a day to ensure system availability.

The first scheduled activation of BSCSTAC was conducted from 11 to 22 December 2023. Switchover procedures laid down at ICG/PTWS-WG-SCS-X and SOP were followed. An email was sent by BSCSTAC about one week before the scheduled activation. Upon the scheduled activation of BSCSTAC, another message was sent by BSCSTAC via email, fax and GTS. A notification by SCSTAC was sent via email, fax and GTS at the end of the period. During the period, no event triggered and necessitated the BSCSTAC to issue tsunami advisory bulletins.

Ms Lam then presented the key performance of the BSCSTAC from 29 March 2023 to 31 October 2024. The average time required for the issuance of the first tsunami advisory bulletin from earthquake occurrence was 9.5 minutes. The mean absolute differences in epicenter location, magnitude and focal depth as compared with the USGS final files of preliminary determination of epicentres were 0.12 degrees, 0.2 and 21 km respectively. The focal mechanism solutions for 11 reviewed cases derived by SeisComP and adopted by BSCSTAC were found to be very similar to those of USGS.

Ms Lam reported that HKO participated in PacWave24 and organised a government-wide table-top exercise of tsunami based on a multi-hazard scenario of Mw 8.8 earthquake at Manila Trench and passage of a tropical cyclone on 31 October 2024. More than 90 staff from 34 government departments or organisations participated in the exercise. During the exercise, tsunami bulletins were issued in the capacity of BSCSTAC to an internal website for performance monitoring, and local tsunami warning and situation reports were issued through intragovernmental communication channels.

The second-year scheduled activation of BSCSTAC was scheduled for 02:00 UTC on 9 to 20 December 2024, a communication test on 22 November 2024, and an email notification of these arrangements on 12 November 2024 were planned.

4.4 REPORT FROM SCS WG TASK TEAM ON CAPACITY DEVELOPMENT AND SERVICES (TT-CDS)

Dr Zhiguo Xu presented a report from the WG-SCS TT-CDS. He began by introducing its background and composition. He then discussed the work that the Task Team has done from September 2023 to November 2024 to improve tsunami warning and service capabilities. This includes updating and upgrading the Smart Tsunami Information Processing System and the Global Earthquake Automatic Detection and Positioning System, developing the GTS sea level data decoding and processing module, creating global tsunami warning products, and constructing a comprehensive database and visualization integration platform for tsunami emergencies. In terms of international training and exchanges on tsunami warning, two earthquake and tsunami training courses were held, and three international staffs from Indonesia, The Philippines, and Malaysia visited SCSTAC for study and exchange. The ICG/PTWS-WG-SCS-XI was successfully held in Guangzhou, China. Additionally, international technical exchanges related to tsunami warning were conducted in various countries and regions, and officials from the tsunami warning departments of the IOC and the Solomon Islands visited SCSTAC. The Task Team will continue to focus on developing methods and tools for tsunami warning and mitigation to enhance the capability of tsunami services. They will also deepen domestic and international cooperation and communication on tsunami warning, promote tsunami warning technology and platforms, provide opportunities for in-person education, outreach, and training activities in the region, and host an online Training Workshop on Tsunami Warning Technology and Platforms in the South China Sea Region.

5. SEISMIC AND SEA LEVEL CORE STATIONS IN THE SOUTH CHINA SEA REGION FOR FURTHER ENHANCING TSUNAMI WARNING CAPABILITY

Dr Jingming Hou introduced the agenda item. Seismic and sea-level measurements play a crucial role in tsunami warning operations through the following aspects:

- Real-time detection: rapid earthquake identification and immediate tsunami recognition
- Earthquake and tsunami analysis: earthquake source parameters
- Focal mechanism determination: tsunami wave characteristics
- Forecast refinement: Real-time tsunami forecast validation, model correction and adjustment
- Threat level management: warning level escalation/de-escalation

Various efforts were undertaken in the past to promote installation of seismic/sea-level stations and data sharing. A training workshop on earthquake and tsunami monitoring on early warning capabilities and data sharing in South China Sea region was organized and hosted jointly by UNESCO-IOC and NMEFC in Hangzhou, China on 21-26 October 2019. The aim was to improve the understanding of data acquisition, treating and management for operational staff of tsunami warning and data management, and most importantly promoting data sharing. In 2018, SCSTAC built a data-flow server for seismic core stations, using SeedLink client for sharing seismic data stream from and to WG-SCS Member States. In 2019, SCSTAC set up data-sharing server for sea-level core stations, through which Member States could share their sea-level data via ftp protocol exclusively for tsunami warning.

Currently, out of the 116 seismic core stations defined, data stream is available only from 40 stations. In the case of the sea-level stations defined in the core network, data from only 13 stations are available. In this regard, it's important to make efforts to improve the data quality and effective transmission of sharing station data, encourage Member States of the WG-SCS to share more seismic and sea-level station data to cope with both seismic and non-seismic tsunamis, and

implement artificial intelligence and advanced analysis methods to optimise data processing and enhance scientific use of the data.

Dr Necmioğlu underlined the importance of identification of the primary source of the problems for low/no data delivery, that may include both technical and non-technical reasons. In case of data unavailability for technical reasons, Member States can explore the means to support each other in providing technical know-how and assistance to the Member States. He further suggested the WG to make strong reference to the 1st Objective of the ODTP in terms of tsunami verification requirement in less than 10 minutes and seek ways to identify how many stations are needed to reach this target so that the network is mission capable.

Mr Zongchen Wang suggested to establish a reporting mechanism between NTWCs and TSPs on the availability of the sea-level data and added that even if real-time data flow is not established from the NTWC to the TSP, tsunami parameters (amplitude, arrival time, period) can be reported so that they can be included in the tsunami bulletins. Dr Necmioğlu pointed out that such flow of information would lack any data quality control mechanisms, and that the TSP would be relying on external provision of parameters for TSP services. Mr Zongchen responded that the quality control should be the responsibility of the data provider, in this case the NTWC.

6. PROGRESS OF THE TSUNAMI DECISION SUPPORTING SYSTEM AT SCSTAC

Mr Zongchen Wang presented the progress on the Tsunami Decision Supporting System. The report outlines the development, operational improvements, and future plans of STIPS, emphasizing its role in tsunami forecasting, decision-making, and warning dissemination. He swiftly navigated through the background and evolution of the Smart Tsunami Information Processing System (STIPS). He then reported that NTWC developed a tailored tsunami forecast software based on STIPS and deployed it in the Macao Meteorological and Geophysical Bureau. The customized tsunami software is capable of implementing a high-resolution 12-hour tsunami forecast originating from earthquakes in the South China Sea region for Macao coastal areas. This procedure is automatically supported by a reliable earthquake parameter source. Additionally, utilizing a workstation equipped with an NVIDIA RTX 2080Ti, a single simulation can be completed in less than 2 minutes, making it both fast and cost-effective. The software is essentially a lightweight version of STIPS, with unnecessary modules removed and the interface redesigned to meet specific requirements. Finally, the numerical forecast results are presented in different formats.

STIPS was first conceptualized in 2015 and became fully operational in 2023. A specialized version, STIPS (HK), was successfully deployed and tested in Hong Kong in 2021, further enhancing the region's tsunami monitoring capabilities. The system was developed in Python, integrating seismology libraries, fast array operations, and a GIS-based UI for efficient decision-making. STIPS can rapidly acquire earthquake information from multiple sources, including SeisComP, USGS, JMA, and CEA. It uses real-time sea-level data from tidal gauges and DART buoys to analyse tsunami wave amplitudes and estimate arrival times. The system leverages on-the-fly tsunami models and a pre-computed tsunami scenario database for quick threat assessment.

In terms of warning and dissemination, STIPS enables the automatic generation of tsunami bulletins in multiple formats, such as DOC, TXT, and HTML. The system supports multi-channel dissemination, including SOP-based alerts and a one-click communication test for efficient dissemination. A lightweight version of STIPS, optimized for Macao, can simulate a 12-hour tsunami impact scenario in just 120 seconds using NVIDIA RTX 2080Ti GPUs, making it cost-effective and fast.

Future improvements to STIPS will focus on machine learning-based tsunami amplitude detection to improve accuracy. Continuous bug fixes and stability enhancements will ensure more

reliable tsunami warnings. Additionally, the system will be upgraded based on changes in SOPs, making it more adaptable to new disaster response strategies. Expanding data sharing with neighbouring countries can improve tsunami early detection and forecasting accuracy. While STIPS has made significant progress, further optimisation in real-time data processing could enhance the speed of warning dissemination. More community engagement programmes could educate local populations on tsunami preparedness and response protocols.

The SCSTAC Tsunami Decision Supporting System has significantly advanced tsunami forecasting and warning dissemination. Its high-speed simulations, real-time data integration, and automation capabilities make it a robust and efficient decision support tool for tsunami risk assessment. Moving forward, leveraging AI, expanding international cooperation, and optimizing response times will further enhance the effectiveness of the System in tsunami disaster mitigation.

Dr Necmioğlu recommended that if the model could be installed and run on the cloud, it would provide an opportunity for broader access. Mr Zongchen Wang responded that it is technically feasible if the virtual cloud is equipped with an NVIDIA GPU device. NMEFC has already shared the numerical forecast model with STMKG-BMKG under a bilateral agreement. If any other Member State is interested in the numerical tsunami model, further discussions are welcomed.

7. TSUNAMI SERVICE PROVIDERS' PRODUCTS AND MESSAGES USER GUIDE

Dr Zhiguo Xu introduced the agenda item. The SCS tsunami advisory products are issued when SCSTAC detects a major earthquake with moment magnitude 6.0 or greater in its Area of Service (AoS), which consists of the main body of the SCS, the Sulu Sea and the Celebes Sea. The SCSTAC (<http://scstac.oceanguide.org.cn>) has been in full operation since 5 November 2019. SCSTAC provides tsunami services for nine Member States of the SCS region include Brunei, Cambodia, China, Indonesia, Malaysia, The Philippines, Singapore, Thailand, and Viet Nam (in alphabetic order). ICG/PTWS-WG-SCS-VIII agreed to accept the document "Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System" as an official publication within the IOC Technical Series No. 149 upon endorsement of the IOC Assembly in 2019. PTWS WG2 Task Team of TSPs proposed Common TSP Users Guide Structure, PTWS-SC has agreed to edit/revise each TSP Users' Guide according to the common structures. SCTAC User's Guide is expected to be finalised by April 2025 and presented to the ICG/PTWS-XXXI. Major improvements are addition of the description of the update status of tsunami warning system and BSCSTAC, and updates on the focal points.

8. UNESCAP CAPACITY ASSESSMENT PROJECT

Ms Suci Dewi Anugrah acknowledged the capacity assessment activity in Asia Pacific in 2024. She delivered that the capacity assessment activity was initiated in the Indian Ocean region. It was started in 2005 due to the requirement of the Assessment of Capacity Building for an Effective and Durable Tsunami Warning and Mitigation System in the Indian Ocean. The initiative was highlighted in the 10th Session UNESCO-IOC/ICG/IOTWMS in Muscat in August 2015. It was revealed there were needs to conduct a reassessment of the state of tsunami preparedness of the Indian Ocean Member States in order to evaluate progress since the 2004 Indian Ocean Tsunami, as well as to identify specific gaps and prioritise capacity development requirements at both regional and national levels. In the 11th Session UNESCO-IOC ICG/IOTWMS in 2017, the intersessional Task Team on Capacity Assessment of Tsunami Preparedness was established to oversee the capacity assessment of tsunami preparedness of the IOTWMS. Task Team designed an extensive online survey covering all aspects of the end-to-end tsunami warning and mitigation system. The result of the Indian Ocean Capacity Assessment was published in 2018. The 2024 capacity assessment is a renewal of the 2018 IOTWMS capacity assessment, and it expands to the PTWS. The assessment provides a narrative on the progress made since the 2004 Indian

Ocean Tsunami, and informs policymakers at the subregional level on the further needs for tsunami preparedness in Asia and the Pacific.

Ms Suci Dewi Anugrah informed there are several documents related to the capacity assessment:

- (i) The Assessment of Capacity Building Requirements for an Effective and Durable Tsunami Warning and Mitigation System in the Indian Ocean, published in 2005;
- (ii) The report of the Capacity Assessment of Tsunami Preparedness in the Indian Ocean based on the 3 pillars and the Executive Summary of the Capacity Assessment of Tsunami Preparedness, published in 2018; and
- (iii) Draft of the report of the Capacity Assessment of Tsunami Preparedness.

The objectives of the Capacity Assessment activity in Asia Pacific in 2024 are:

- (i) to evaluate the existing capacity of the UNESCO-IOC Indian Ocean Tsunami Warning and Mitigation System (IOTWMS) (Phase 1) and Pacific Tsunami Warning System (PTWS) (Phase 2);
- (ii) to identify specific gaps and capacity development requirements at regional and national levels for strengthening the technical and policy aspects of the tsunami warning and mitigation systems in the region; and
- (iii) to provide recommendations for the next strategic phase of ESCAP's Trust Fund for Tsunami Disaster and Climate Preparedness.

The Assessment will be conducted following the methodology of:

- (i) National technical online survey to be completed by Member States with guidance from UNESCO-IOC;
- (ii) Survey analysis to understand the capacity building requirements across the ocean basin and progress over time;
- (iii) Validation workshops and sharing of good practices with ICG/PTWS Steering Committee;
- (iv) Endorsement including final review, endorsement by ICG and adoption by the respective UNESCO-IOC ICGs.

The assessment for the ICG/PTWS will be started in 2025 and the output will include the Member States survey analysis, the PTWS assessment summary and comparative analysis, the tsunami preparedness recommendations for PIF policymaker. The survey consists of six distinct parts, which may need inputs from different stakeholders based on their national responsibility in the end-to-end tsunami warning and mitigation system, those are: (i) Basic Information; (ii) Risk Assessment and Reduction; (iii) Detection, Warning and Dissemination; (iv) Public Awareness, Preparedness and Response; (v) TRRP; and (vi) Narrative information on important recent developments of Tsunami Warning and Mitigation System and summary of future plans.

9. RESPONSE PLAN ON THE IMPLEMENTATION OF TSUNAMI READY PROGRAMME IN THE SOUTH CHINA SEA REGION

Mr Abdul Rosid from Indonesia presented the Plan on the Implementation of Tsunami Ready Programme in The South China Sea Region. He recalled the TRRP as a community-based initiative designed to enhance preparedness and reduce tsunami risks through active collaboration among communities, leaders, and emergency management agencies. Its primary goal is to minimize loss of life, livelihoods, and property by promoting a systematic and structural approach to tsunami preparedness based on 12 key performance indicators.

Mr Abdul Rosid shared at the meeting the implementation of TRRP in Indonesia. The programme is accelerated by the earthquake and tsunami awareness education for community of the Earthquake and Tsunami Field School (SLG) program of BMKG, which raises awareness and response capabilities among stakeholders such as local governments, disaster management organizations, and the private sector through field surveys, workshops, and exercises. Furthermore, Indonesia through BMKG has facilitated international recognition for 10 communities as Tsunami Ready by UNESCO-IOC and supported 12 others in achieving national recognition, with plans to continue working toward international recognition by the end of 2024 including 4 villages in Aceh.

Internationally, BMKG also took part in training programmes in Seychelles and Maldives. It shared UNESCO's indicators and best practices to support tsunami awareness goals under the UN Ocean Decade initiative.

Looking ahead, the program aims to expand into the South China Sea region, leveraging successful models and fostering collaboration for training and logistical support as had been done in Seychelles and Maldives. He recommended to implement the TRRP in The Philippines, as the pilot project in the South China Sea region.

10. REVIEW AND PLAN OF THE SCSTAC INTERNATIONAL STAFF PROGRAMME

At its 7th meeting, the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS-VII, 6–8 March 2018, Hanoi, Viet Nam) welcomed SCSTAC's proposal to host short-term international staff every year from the Member States of the regional working group with travel and local expenses covered by SCSTAC. While the programme experienced difficulties during the period of COVID pandemic, a total of 12 experts from Indonesia, Malaysia, The Philippines, and Viet Nam have successfully finished the programme during 2022-2024.

11. NEXT MEETING

Dr Necmioğlu briefed the group members on the internal UNESCO guidance to hold meetings and recurring conferences in-person only every second year, and online every other, in order to reduce UNESCO's carbon footprint to meet its set target of reducing its emissions by 31 per cent by 2030, in line with the goals of the Paris Agreement. Also noting the budget availability of the Member States and the number of ICG meetings every year, the group decided to consider conducting its future meetings from 2025 onwards in-person only every second year, and online every other, and in that respect. It also decided to conduct the 13th Meeting of the ICG/PTWS WG-SCS in 2025 online. Ms Ching-chi LAM recalled the WG-SCS-XI meeting's suggestion of hosting the 14th Meeting of WG-SCS by China in Hong Kong and responded that the venue could be in the Hong Kong Observatory Headquarters and the timing could be tentatively in early December of 2026, which was appreciated by the group members.

12. ANY OTHER BUSINESS

Mr. Wahyu Pandoe, the Chair of National Committee Program of Intergovernmental Oceanographic Commission UNESCO-IOC was invited to present the earthquake and Tsunami Monitoring and Warnings using Cable-Based Tsunameter (CBT). The National Research and Innovation Agency (BRIN) Indonesia has developed the Indonesia Cable-based Tsunameter (InaCBT) system. Since deployment in February 2022, nearly 3 years from now, the system has fully functioned and remained in research and development status. This InaCBT system installed in the Flores Sea utilises 54km length of single 12-cores fibre optic cable from the shoreline of Labuan Bajo City Flores Island extending northward to the deep Flores Sea, Two Ocean Bottom

Units (OBUs) equipped with precise pressure sensors and accelerometers attached to the fiber-optic cable at 34km (2100m deep), and 54km (4120m deep) respectively.

The 1-Hz sampling rate data from the pressure sensors were processed using the Lanczos filter to distinguish between high-frequency seismic waves and low-frequency signals that might indicate the presence of typical or atypical tsunami waves. The follow-up questions are then:

- How to distinguish earthquake source: seismic vs non-seismic tsunami?
- How to distinguish Primary, Secondary, Surface, and other waves?

Consider that each type of waves can be classified by its frequency range, period and duration of generation, and how fast it decays. The results highlight the importance of improving (near) real-time filtering techniques and increasing the system's sensitivity to enhance its ability to provide timely and accurate warnings for near-field and atypical tsunami events.

13. SUMMARY OF DECISIONS, RECOMMENDATIONS AND ACTIONS

The Decisions and the Recommendations of the ICG/PTWS-WG-CA XII are available in [Annex II](#) of this report.

14. CLOSE OF MEETING

The Chair, Ms Suci Anugrah closed the meeting on 8 November 2024 at 0430 UTC. She also thanked Member States for the valuable discussion and wished a strong collaboration among member in the future. She hoped more engagements from other Member States absent from this meeting to actively participate in the Working Group. She expected meeting some of the participants at the 2024 Global Tsunami Symposium in Banda Aceh.

The Technical Secretary, Dr Öcal Necmioglu, expressed deep gratitude to Indonesia for hosting this meeting. He also thanked Member States for contribution to the WG-SCS.

ANNEX I

AGENDA

- 1. WELCOME AND OPENING**
 - 2. ORGANIZATION OF THE SESSION**
 - 2.1. ADOPTION OF AGENDA
 - 2.2. DESIGNATION OF RAPPORTEUR
 - 2.3. CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION
 - 3. REVIEW OF DECISIONS, RECOMMENDATIONS AND ACTIONS ARISING FROM ICG/PTWS WG-SCS-XI MEETING AND ICG/PTWS – SC MEETING**
 - 4. REPORTS**
 - 4.1. NATIONAL PROGRESS REPORTS
 - 4.1.1. CHINA
 - 4.1.2. INDONESIA
 - 4.1.3. MALAYSIA
 - 4.1.4. THE PHILIPPINES
 - 4.1.5. VIET NAM
 - 4.2. REPORT FROM SCSTAC
 - 4.3. REPORT FROM BCSSTAC (HONG KONG)
 - 4.4. REPORT FROM SCS WG TASK TEAM ON CAPACITY DEVELOPMENT AND SERVICES
 - 5. SEISMIC AND SEA LEVEL CORE STATIONS IN THE SOUTH CHINA SEA REGION FOR FURTHER ENHANCING TSUNAMI WARNING CAPABILITY**
 - 6. PROGRESS OF THE TSUNAMI DECISION SUPPORTING SYSTEM AT SCSTAC**
 - 7. TSUNAMI SERVICE PROVIDERS' PRODUCTS AND MESSAGES USER GUIDE**
 - 8. UNESCAP CAPACITY ASSESSMENT PROJECT**
 - 9. PLAN ON THE IMPLEMENTATION OF TSUNAMI READY PROGRAMME IN THE SOUTH CHINA SEA REGION**
 - 10. REVIEW AND PLAN OF THE SCSTAC INTERNATIONAL STAFF PROGRAMME**
 - 11. NEXT MEETING**
 - 12. ANY OTHER BUSINESS**
 - 13. SUMMARY OF DECISIONS, RECOMMENDATIONS AND ACTIONS**
 - 14. CLOSE OF MEETING**
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Appendix 1

Terms of Reference

Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS)

1. To evaluate capabilities of countries in the South China Sea region for providing end-to-end tsunami warning and mitigation services.
2. To ascertain requirements from countries in the South China Sea region for the tsunami warning and mitigation services.
3. To promote and facilitate tsunami hazard and risk studies in the region.
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region.
5. To facilitate improvement of the education programmes on tsunami mitigation in the region.
6. To facilitate capacity building and the sharing of tsunami information in the region, including the free and open exchange of data.
7. To serve as a coordination point within the region for member states proposals related to UNODTP objectives, and advising the PTWS SC on details of such proposals for consideration.

The Group will be composed of members nominated by Member States Brunei, Cambodia, China, Indonesia, Malaysia, The Philippines, Singapore, Thailand, Viet Nam and invited experts with a Chair and Vice-Chair to be elected by the members of the Working Group and endorsed by the ICG/PTWS.

Appendix 2

Terms of Reference

Regional Working Group on Tsunami Warning and Mitigation for the South China Sea Region Task Team on Capacity Development and Services

1. To coordinate training workshops and other technical exchanges on topics related to earthquake and tsunami for enhancing the tsunami warning capabilities of the WG-SCS Member States.
2. To facilitate implementation of the International Staff Programme for short-term secondment of staff from WG-SCS Member States to SCSTAC on an annual basis.
3. To explore ways for furthering the sharing and exchange of relevant data and information in the South China Sea region.
4. To ascertain the latest requirements of WG-SCS Member States for tsunami advisory service provided by SCSTAC.

Membership: Representatives of Member States of the ICG/PTWS WG-SCS (Brunei Darussalam, Cambodia, China, Indonesia, Malaysia, The Philippines, Singapore, Thailand and Viet Nam) and invited experts; representatives of PTWC and NWPTAC (JMA); with Chair and Vice-Chair to be elected either by the WG-SCS or the ICG/PTWS.

ANNEX II

Draft Recommendations to be submitted to ICG/PTWS-XXXI

Tsunami Warning and Mitigation System for the South China Sea Region: Sharing of Seismic and Sea Level Stations, Capacity Building and Next Meeting

The Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS),

Welcomes China's proposal to continue with the International Staff Programme to host seconded experts at the South China Sea Tsunami Advisory Center (SCSTAC) from the Member States of the WG-SCS in 2025, with the travel and local expenses covered by the National Marine Environmental Forecasting Center (NMEFC), and requests the IOC Secretariat to make an announcement to all Member States' National Tsunami Warning Center (NTWC), Tsunami National Contacts (TNC) and Tsunami Warning Focal Points (TWFP) of WG-SCS to encourage participation of the Member States especially those who have not joined before;

Noting:

- Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted by UN Member States on 18 March 2015 at the World Conference for Disaster Risk Reduction (WCDRR) with one of the seven global targets to substantially increase the availability of and access to Multi-Hazard Early Warning Systems (MHEWS) and disaster risk information and assessments to people by 2030 to contribute to the initiative of Early Warnings for All (EW4All),
- IOC Decision A-31/3.4.1 on Warning Mitigation Systems for Ocean Hazards approved the establishment of the Ocean Decade Tsunami Programme (PROGRAMME) and a Scientific Committee (SC) to prepare the draft 10-Year Research, Development and Implementation Plan for this PROGRAMME,
- IOC Decision A-32/3.4.1 on Warning Mitigation Systems for Ocean Hazards decided to endorse the 10-Year Research, Development and Implementation Plan of the Ocean Decade Tsunami Programme as presented in document IOC/A-32/3.4.1.2.Doc(1),

Encourages the Member States of the WG-SCS to implement the IOC-UNESCO Tsunami Ready Recognition Programme (TRRP) or its equivalency for building community preparedness and resiliency to reduce tsunami-related risks, and to share progress and outcomes to meet the UN Ocean Decade Tsunami Programme goal of 100% tsunami ready by 2030;

Requests the Task Team on Capacity Development and Services to promote the conduct of trainings related to the indicators in the TRRP by engaging more experts from WG-SCS to serve as resource persons or trainers for this activity;

Recalling that the Tsunami Service Providers (TSPs) User's Guide needs to be revised to follow a common structure and required to be submitted a month before the 31st Session of the ICG/PTWS on 7-11 April 2025 in Beijing,

Noting that the SCSTAC is revising its User's Guide,

Requests the SCSTAC to make ready the draft revised User's Guide by December 2024 for the Chair of the WG-SCS to circulate it to Member States for review by January 2025;

Acknowledging and appreciating the efforts of the Task Team on Capacity Development and Services to enhance the capacity of Member States,

Recognizing the importance of capacity building and the associated activities,

Strongly encourages Member States to contribute to capacity development activities such as identification of resource persons or experts to conduct roving seminars/workshops/technical visits to promote exchanges and experience sharing among Member States in order to achieve the goal of tsunami resilience in a sustainable way;

Recalling that the first objective of the Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme (ODTP) is to develop the warning systems' capability to issue actionable and timely tsunami warnings for tsunamis from all identified sources to 100 percent of coasts at risk,

Further noting that most urgently, the ODTP will endeavor to provide tsunami confirmation within 10 minutes or less of origin for the most at-risk coastlines,

Strongly encourages the Member States of the WG-SCS to share more seismic and sea level stations data for tsunami warning purposes in accordance with the IOC Oceanographic Data Exchange Policy to further enhance the tsunami warning capability in the South China Sea region in order to be able to meet this target;

Requests the Member States of the WG-SCS to regularly update information on NTWC, TNC and TWFP with IOC Secretariat following the established procedures;

Noting:

- the UNESCO recommendation reported by the Secretariat to hold meetings and recurring conferences in-person only every second year, and online every other, in order to reduce UNESCO's carbon footprint to meet its set target of reducing its emissions by 31 per cent by 2030, in line with the goals of the Paris Agreement,
- the budget availability of the Member States and the number of ICG meetings every year,

Decides to consider conducting its future meetings from 2025 onwards in-person only every second year, and online every other;

Also decides to conduct the 13th meeting of the ICG/PTWS WG-SCS in 2025 online;

Accepts with appreciation the offer of China to host the Fourteenth Meeting of WG-SCS in Hong Kong tentatively in early December of 2026.

ANNEX III

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Group photo of the Twelfth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS-XII) held on 8 and 9 November 2024 in DKI Jakarta, Indonesia

ANNEX IV

LIST OF ACRONYMS

BSCSTAC	Backup South China Sea Tsunami Advisory Center (Hong Kong)
BIG	Agency of Geospatial Information
BMKG	Agency for Meteorology, Climatology, and Geophysics
CEA	China Earthquake Administration
DSS	Decision Supporting System
EITW	Viet Nam Earthquake Information and Tsunami Warning Centre
EQFS	Earthquake Field School
HKO	Hong Kong Observatory
ICG	Intergovernmental Coordination Group
IGP	Institute of Geophysics
InaTEWS	Indonesia Tsunami Early Warning System
IOC	Intergovernmental Oceanographic Commission
IOTIC	Indian Ocean Tsunami Information Center
ITIC	International Tsunami Information Center
ITST	International Tsunami Survey Team
JMA	Japan Meteorological Agency
LDMO	Local Disaster Management Office
MMD	Malaysian Meteorological Department
MSS	Meteorological Service Singapore
NDMO	National Disaster Management Office
NMEFC	National Marine Environmental Forecasting Centre
NTWC	National Tsunami Warning Centre
NTWS	National Tsunami Warning System
NWPTAC	Northwest Pacific Tsunami Advisory Center
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PSN	Philippine Seismic Network
PTWC	Pacific Tsunami Warning Center
QEM	Quick Earthquake Message
SCS	South China Sea
SCSTAC	South China Sea Tsunami Advisory Center
SMS	Short Message System
SOP	Standard Operating Procedure
TEMPP	Tsunami Evacuation Map, Plans and Procedures
TIC	Tsunami Information Centre
TSP	Tsunami Service Provider
TT-SCSTAC	South China Sea Tsunami Advisory Center Task Team
UNESCO	United Nations Educational, Scientific and Cultural Organization
VAST	Viet Nam Academy of Science and Technology
WFH	Work From Home
WG-SCS	Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region
WRS	Warning Receiver System

In this Series, entitled

Reports of Meetings of Experts and Equivalent Bodies, which was initiated in 1984 and which is published in English only, unless otherwise specified, the reports of the following meetings have already been issued:

1. Third Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans
2. Fourth Meeting of the Central Editorial Board for the Geological/Geophysical Atlases of the Atlantic and Pacific Oceans S. Fourth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
4. First Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
5. First Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
6. First Session of the Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
7. First Session of the Joint CCOP(SOPAC)-IOC Working Group on South Pacific Tectonics and Resources
8. First Session of the IODE Group of Experts on Marine Information Management
9. Tenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies in East Asian Tectonics and Resources
10. Sixth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
11. First Session of the IOC Consultative Group on Ocean Mapping (**Also printed in French and Spanish**)
12. Joint 100-WMO Meeting for Implementation of IGOSS XBT Ships-of-Opportunity Programmes
13. Second Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
14. Third Session of the Group of Experts on Format Development
15. Eleventh Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
16. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
17. Seventh Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
18. Second Session of the IOC Group of Experts on Effects of Pollutants
19. Primera Reunión del Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y Parte del Océano Pacífico frente a Centroamérica (**Spanish only**)
20. Third Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
21. Twelfth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of South-East Asian Tectonics and Resources
22. Second Session of the IODE Group of Experts on Marine Information Management
23. First Session of the IOC Group of Experts on Marine Geology and Geophysics in the Western Pacific
24. Second Session of the IOC-UN(OETB) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources (**Also printed in French and Spanish**)
25. Third Session of the IOC Group of Experts on Effects of Pollutants
26. Eighth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
27. Eleventh Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (**Also printed in French**)
28. Second Session of the IOC-FAO Guiding Group of Experts on the Programme of Ocean Science in Relation to Living Resources
29. First Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
30. First Session of the IOCARIBE Group of Experts on Recruitment in Tropical Coastal Demersal Communities (**Also printed in Spanish**)
31. Second IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
32. Thirteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asia Tectonics and Resources
33. Second Session of the IOC Task Team on the Global Sea-Level Observing System
34. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and Overlay Sheets
35. Fourth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
36. First Consultative Meeting on RNODCs and Climate Data Services
37. Second Joint IOC-WMO Meeting of Experts on IGOSS-IODE Data Flow
38. Fourth Session of the Joint CCOP/SOPAC-IOC Working Group on South Pacific Tectonics and Resources
39. Fourth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
40. Fourteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
41. Third Session of the IOC Consultative Group on Ocean Mapping
42. Sixth Session of the Joint IOC-WMO-CCPS Working Group on the Investigations of 'El Niño' (**Also printed in Spanish**)
43. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
44. Third Session of the IOC-UN(OALOS) Guiding Group of Experts on the Programme of Ocean Science in Relation to Non-Living Resources
45. Ninth Session of the IOC-UNEP Group of Experts on Methods, Standards and Intercalibration
46. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
47. Cancelled
48. Twelfth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
49. Fifteenth Session of the Joint CCOP-IOC Working Group on Post-IDOE Studies of East Asian Tectonics and Resources
50. Third Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
51. First Session of the IOC Group of Experts on the Global Sea-Level Observing System
52. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean
53. First Session of the IOC Editorial Board for the International Chart of the Central Eastern Atlantic (**Also printed in French**)
54. Third Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (**Also printed in Spanish**)
55. Fifth Session of the IOC-UNEP-IMO Group of Experts on Effects of Pollutants
56. Second Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean
57. First Meeting of the IOC *ad hoc* Group of Experts on Ocean Mapping in the WESTPAC Area
58. Fourth Session of the IOC Consultative Group on Ocean Mapping
59. Second Session of the IOC-WMO/IGOSS Group of Experts on Operations and Technical Applications
60. Second Session of the IOC Group of Experts on the Global Sea-Level Observing System

61. UNEP-IOC-WMO Meeting of Experts on Long-Term Global Monitoring System of Coastal and Near-Shore Phenomena Related to Climate Change
62. Third Session of the IOC-FAO Group of Experts on the Programme of Ocean Science in Relation to Living Resources
63. Second Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
64. Joint Meeting of the Group of Experts on Pollutants and the Group of Experts on Methods, Standards and Intercalibration
65. First Meeting of the Working Group on Oceanographic Co-operation in the ROPME Sea Area
66. Fifth Session of the Editorial Board for the International Bathymetric and its Geological/Geophysical Series
67. Thirteenth Session of the IOC-IHO Joint Guiding Committee for the General Bathymetric Chart of the Oceans (**Also printed in French**)
68. International Meeting of Scientific and Technical Experts on Climate Change and Oceans
69. UNEP-IOC-WMO-IUCN Meeting of Experts on a Long-Term Global Monitoring System
70. Fourth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
71. ROPME-IOC Meeting of the Steering Committee on Oceanographic Co-operation in the ROPME Sea Area
72. Seventh Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño' (**Spanish only**)
73. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (**Also printed in Spanish**)
74. UNEP-IOC-ASPEI Global Task Team on the Implications of Climate Change on Coral Reefs
75. Third Session of the IODE Group of Experts on Marine Information Management
76. Fifth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
77. ROPME-IOC Meeting of the Steering Committee for the Integrated Project Plan for the Coastal and Marine Environment of the ROPME Sea Area
78. Third Session of the IOC Group of Experts on the Global Sea-level Observing System
79. Third Session of the IOC-IAEA-UNEP Group of Experts on Standards and Reference Materials
80. Fourteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans
81. Fifth Joint IOG-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
82. Second Meeting of the UNEP-IOC-ASPEI Global Task Team on the Implications of climate Change on Coral Reefs
83. Seventh Session of the JSC Ocean Observing System Development Panel
84. Fourth Session of the IODE Group of Experts on Marine Information Management
85. Sixth Session of the IOC Editorial Board for the International Bathymetric chart of the Mediterranean and its Geological/Geophysical Series
86. Fourth Session of the Joint IOC-JGOFS Panel on Carbon Dioxide
87. First Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Pacific
88. Eighth Session of the JSC Ocean Observing System Development Panel
89. Ninth Session of the JSC Ocean Observing System Development Panel
90. Sixth Session of the IODE Group of Experts on Technical Aspects of Data Exchange
91. First Session of the IOC-FAO Group of Experts on OSLR for the IOCINCWIO Region
92. Fifth Session of the Joint IOC-JGOFS CO₂ Advisory Panel Meeting
93. Tenth Session of the JSC Ocean Observing System Development Panel
94. First Session of the Joint CMM-IGOSS-IODE Sub-group on Ocean Satellites and Remote Sensing
95. Third Session of the IOC Editorial Board for the International Chart of the Western Indian Ocean
96. Fourth Session of the IOC Group of Experts on the Global Sea Level Observing System
97. Joint Meeting of GEMSI and GEEP Core Groups
98. First Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
99. Second International Meeting of Scientific and Technical Experts on Climate Change and the Oceans
100. First Meeting of the Officers of the Editorial Board for the International Bathymetric Chart of the Western Pacific
101. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico
102. Second Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
103. Fifteenth Session of the Joint IOC-IHO Committee for the General Bathymetric Chart of the Oceans
104. Fifth Session of the IOC Consultative Group on Ocean Mapping
105. Fifth Session of the IODE Group of Experts on Marine Information Management
106. IOC-NOAA *Ad hoc* Consultation on Marine Biodiversity
107. Sixth Joint IOC-WMO Meeting for Implementation of IGOSS XBT Ship-of-Opportunity Programmes
108. Third Session of the Health of the Oceans (HOTO) Panel of the Joint Scientific and Technical Committee for GLOSS
109. Second Session of the Strategy Subcommittee (SSC) of the IOC-WMO-UNEP Intergovernmental Committee for the Global Ocean Observing System
110. Third Session of the Joint Scientific and Technical Committee for Global Ocean Observing System
111. First Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate
112. Sixth Session of the Joint IOC-JGOFS CO₂ Advisory Panel Meeting
113. First Meeting of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS)
114. Eighth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of "El Niño" (**Spanish only**)
115. Second Session of the IOC Editorial Board of the International Bathymetric Chart of the Central Eastern Atlantic (**Also printed in French**)
116. Tenth Session of the Officers Committee for the Joint IOC-IHO General Bathymetric Chart of the Oceans (GEBCO), USA, 1996
117. IOC Group of Experts on the Global Sea Level Observing System (GLOSS), Fifth Session, USA, 1997
118. Joint Scientific Technical Committee for Global Ocean Observing System (J-GOOS), Fourth Session, USA, 1997
119. First Session of the Joint 100-WMO IGOSS Ship-of-Opportunity Programme Implementation Panel, South Africa, 1997
120. Report of Ocean Climate Time-Series Workshop, Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate, USA, 1997
121. IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional Global Ocean Observing System (NEAR-GOOS), Second Session, Thailand, 1997
122. First Session of the IOC-IUCN-NOAA *Ad hoc* Consultative Meeting on Large Marine Ecosystems (LME), France, 1997

123. Second Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), South Africa, 1997
124. Sixth Session of the IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico, Colombia, 1996 **(also printed in Spanish)**
125. Seventh Session of the IODE Group of Experts on Technical Aspects of Data Exchange, Ireland, 1997
126. IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), First Session, France, 1997
127. Second Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 1998
128. Sixth Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1997
129. Sixth Session of the Tropical Atmosphere - Ocean Array (TAO) Implementation Panel, United Kingdom, 1997
130. First Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 1998
131. Fourth Session of the Health of the Oceans (HOTO) Panel of the Global Ocean Observing System (GOOS), Singapore, 1997
132. Sixteenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), United Kingdom, 1997
133. First Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1998
134. Fourth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IOC/EB-IBCWIO-IW3), South Africa, 1997
135. Third Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), France, 1998
136. Seventh Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Germany, 1997
137. Implementation of Global Ocean Observations for GOOS/GCOS, First Session, Australia, 1998
138. Implementation of Global Ocean Observations for GOOS/GCOS, Second Session, France, 1998
139. Second Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Brazil, 1998
140. Third Session of IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), China, 1998
141. Ninth Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Ecuador, 1998 **(Spanish only)**
142. Seventh Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Croatia, 1998
143. Seventh Session of the Tropical Atmosphere-Ocean Array (TAO) Implementation Panel, Abidjan, Côte d'Ivoire, 1998
144. Sixth Session of the IODE Group of Experts on Marine Information Management (GEMIM), USA, 1999
145. Second Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), China, 1999
146. Third Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Ghana, 1999
147. Fourth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC); Fourth Session of the WCRP CLIVAR Upper Ocean Panel (UOP); Special Joint Session of OOPC and UOP, USA, 1999
148. Second Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), France, 1999
149. Eighth Session of the Joint IOC-JGOFS CO2 Advisory Panel Meeting, Japan, 1999
150. Fourth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Japan, 1999
151. Seventh Session of the IOC Consultative Group on Ocean Mapping (CGOM), Monaco, 1999
152. Sixth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 1999
153. Seventeenth Session of the Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO), Canada, 1999
154. Comité Editorial de la COI para la Carta Batimétrica Internacional del Mar Caribe y el Golfo de Mexico (IBCCA), Septima Reunión, Mexico, 1998
IOC Editorial Board for the International Bathymetric Chart of the Caribbean Sea and the Gulf of Mexico (IBCCA), Seventh Session, Mexico, 1998
155. Initial Global Ocean Observing System (GOOS) Commitments Meeting, IOC-WMO-UNEP-ICSU/Impl-III/3, France, 1999
156. First Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Venezuela, 1999 **(also printed in Spanish and French)**
157. Fourth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), China, 1999
158. Eighth Session of the IOC Editorial Board for the International Bathymetric Chart of the Mediterranean and its Geological/Geophysical Series, Russian Federation, 1999
159. Third Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS), Chile, 1999
160. Fourth Session of the IOC-WMO-UNEP-ICSU-FAO Living Marine Resources Panel of the Global Ocean Observing System (GOOS). Hawaii, 2000
161. Eighth Session of the IODE Group of Experts on Technical Aspects of Data Exchange, USA, 2000
162. Third Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LME), France, 2000
163. Fifth Session of the IOC-WMO-UNEP-ICSU Coastal Panel of the Global Ocean Observing System (GOOS), Poland, 2000
164. Third Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System (GOOS), France, 2000
165. Second Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, Cuba, 2000 **(also printed in Spanish and French)**
166. First Session of the Coastal Ocean Observations Panel, Costa Rica, 2000
167. First GOOS Users' Forum, 2000
168. Seventh Session of the Group of Experts on the Global Sea Level Observing System, Honolulu, 2001
169. First Session of the Advisory Body of Experts on the Law of the Sea (ABE-LOS), France, 2001 **(also printed in French)**
170. Fourth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, Chile, 2001
171. First Session of the IOC-SCOR Ocean CO₂ Advisory Panel, France, 2000
172. Fifth Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Norway, 2000 **(electronic copy only)**
173. Third Session of the *ad hoc* Advisory Group for IOCARIBE-GOOS, USA, 2001 **(also printed in Spanish and French)**
174. Second Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Italy, 2001
175. Second Session of the Black Sea GOOS Workshop, Georgia, 2001
176. Fifth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2000
177. Second Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Morocco, 2002 **(also printed in French)**
178. Sixth Session of the Joint GCOS-GOOS-WCRP Ocean Observations Panel for Climate (OOPC), Australia, 2001 **(electronic copy only)**
179. *Cancelled*
180. Second Session of the IOC-SCOR Ocean CO₂ Advisory Panel, Honolulu, Hawaii, U.S.A, 2002 **(electronic copy only)**

181. IOC Workshop on the Establishment of SEAGOOS in the Wider Southeast Asian Region, Seoul, Republic of Korea, 2001 (SEAGOOS preparatory workshop) **(electronic copy only)**
182. First Session of the IODE Steering Group for the Resource Kit, USA, 19–21 March 2001
183. Fourth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), France, 2002
184. Seventh Session of the IODE Group of Experts on Marine Information Management (GEMIM), France, 2002 **(electronic copy only)**
185. Sixth Session of IOC/WESTPAC Coordinating Committee for the North-East Asian Regional - Global Ocean Observing System (NEAR-GOOS), Republic of Korea, 2001 **(electronic copy only)**
186. First Session of the Global Ocean Observing System (GOOS) Capacity Building Panel, Switzerland, 2002 **(electronic copy only)**
187. Fourth Session of the ad hoc Advisory Group for IOCARIBE-GOOS, 2002, Mexico **(also printed in French and Spanish)**
188. Fifth Session of the IOC Editorial Board for the International Bathymetric Chart of the Western Indian Ocean (IBCWIO), Mauritius, 2000
189. Third session of the Editorial Board for the International Bathymetric Chart of the Western Pacific, China, 2000
190. Third Session of the Coastal Ocean Observations Panel and GOOS Users' Forum, Vietnam, 2002
191. Eighth Session of the IOC Consultative Group on Ocean Mapping, Russian Federation, 2001
192. Third Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Lisbon, 2003 **(also printed in French)**
193. Extraordinary Session of the Joint IOC-WMO-CPPS Working Group on the Investigations of 'El Niño', Chile, 1999 **(Spanish only; electronic copy only)**
194. Fifth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, France, 2002
195. Sixth Session of the IOC-WMO-UNEP-ICSU Steering Committee of the Global Ocean Observing System, South Africa, 2003
196. Fourth Session of the Coastal Ocean Observations Panel, South Africa, 2002 **(electronic copy only)**
197. First Session of the JCOMM/IODE Expert Team On Data Management Practices, Belgium, 2003 **(also JCOMM Meeting Report No. 25)**
198. Fifth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2003
199. Ninth Session of the IOC Consultative Group on Ocean Mapping, Monaco, 2003 **(Recommendations in English, French, Russian and Spanish included)**
200. Eighth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2003 **(electronic copy only)**
201. Fourth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Greece, 2004 **(also printed in French)**
202. Sixth Session of the IOC-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2004 **(electronic copy only)**
203. Fifth Session of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Argentina, 2005 **(also printed in French)**
204. Ninth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), France, 2005 **(electronic copy only)**
205. Eighth Session of the IOC/WESTPAC Co-ordinating Committee for the North-East Asian Regional – Global Ocean Observing System (NEAR-GOOS), China, 2003 **(electronic copy only)**
206. Sixth Meeting of the Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Spain, 2006 **(also printed in French)**
207. Third Session of the Regional Forum of the Global Ocean Observing System, South Africa, 2006 **(electronic copy only)**
208. Seventh Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2005 **(electronic copy only)**
209. Eighth Session of the IOC-UNEP-IUCN-NOAA Consultative Meeting on Large Marine Ecosystems (LMEs), Paris, 2006 **(electronic copy only)**
210. Seventh Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Gabon, 2007 **(bilingual English/French)**
211. First Meeting of the IOC Working Group on the Future of IOC, Paris, 2008 **(Executive Summary in English, French, Russian and Spanish included)**
212. First meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 3–4 April 2008 **(Executive Summary in English, French, Russian and Spanish included)**
213. First Session of the Panel for Integrated Coastal Observation (PICO-I), Paris, 10–11 April 2008 **(electronic copy only)**
214. Tenth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 6–8 June 2007 **(electronic copy only)**
215. Eighth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 21–25 April 2008 **(bilingual English/French)**
216. Fourth Session of the Global Ocean Observing System (GOOS) Regional Alliances Forum (GRF), Guayaquil, Ecuador, 25–27 November 2008 **(electronic copy only)**
217. Second Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 27 March 2009 **(Executive Summary in English, French, Russian and Spanish included)**
218. Ninth Meeting of the IOC Advisory Body of Experts on the Law of the Sea (IOC/ABE-LOS), Paris, 30 March–3 April 2009 **(bilingual English/French)**
219. First Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 3), Broomfield, Colorado, U.S.A., 1 October 2005 **(electronic copy only)**
220. Second Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 6), Paris, France, 20 April 2007 **(electronic copy only)**
221. Third Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 10), Villefranche-sur-mer, France, 3–4 October 2008 **(electronic copy only)**
222. Fourth Session of the IOC-SCOR International Ocean Carbon Coordination Project (IOCCP) Scientific Steering Group (also IOCCP Reports, 15), Jena, Germany, 14 September 2009 **(electronic copy only)**
223. First Meeting of the joint IOC-ICES Study Group on Nutrient Standards (SGONS) (also IOCCP Reports, 20), Paris, France, 23–24 March 2010 **(Executive Summary in E, F, R, S included)**
224. Third Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Lisbon, Portugal, 5–6 May 2010 **(Executive Summary in English, French, Russian and Spanish included)**
225. Eleventh Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 13–15 May 2009 **(electronic copy only)**
226. Second Session of the Panel for Integrated Coastal Observation (PICO-II), Paris, 24–26 February 2009 **(electronic copy only)**
227. First meeting of the Task Team on Seismic Data Exchange in the South West Pacific of the ICG/PTWS Regional Working Group for the Southwest Pacific, Port Vila, Vanuatu, 19–20 October 2009 **(electronic copy only)**
228. Fourth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, France, 20–21 March 2011 **(Executive Summary in English, French, Russian and Spanish included)**
229. Second Session of the IODE Steering Group for Ocean Teacher (SG-OT), Miami, Florida, 11–15 April 2011
230. First Meeting of the Inter-ICG Task Team 1 on Sea Level Monitoring for Tsunami (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
231. First Meeting of the Inter-ICG Task Team 2 on Disaster Management and Preparedness (Working Group on Tsunamis and Other Hazards Related to

- Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
232. First Meeting of the Inter-ICG Task Team 3 on Tsunami Watch Operations (Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Seattle, USA, 29 November–1 December 2010
 233. Primera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) del 4 al 6 de noviembre de 2009 (**Resumen dispositivo en español e inglés**)
 234. Segunda Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), San Salvador (El Salvador) del 28 al 30 de septiembre de 2011 (**Resumen dispositivo en español e inglés**)
 235. First Session of the Joint IODE-JCOMM Steering Group for the Global Temperature-Salinity Profile Programme (SG-GTSP), 16–20 April 2012, Ostend, Belgium
 236. Ad hoc Session of the Joint JCOMM-IODE Steering Group for the Ocean Data Standards Pilot Project (SG-ODSPP), 23–25 April 2012, Ostend, Belgium
 237. First Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Sanya, China, 12–14 December 2011
 238. First Meeting of the IODE Steering Group for OceanDocs (SG-OceanDocs), 24–27 January 2012, Ostend, Belgium
 239. Fifth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Tokyo, Japan, 15 February 2012 (**Executive Summary in English, French, Russian and Spanish included**)
 240. Ad hoc Session of the IODE Group of Experts on Biological and Chemical Data Management and Exchange Practices (GE-BICH), Ostend, Belgium, 25 October 2012
 241. Twelfth Session of the IODE Group of Experts on Marine Information Management (GE-MIM), Miami, USA, 22–25 January 2013
 242. Twelfth Session of the IOC Group of Experts on the Global Sea level Observing System (GLOSS), Paris, 9–11 November 2011 (**electronic copy only**)
 243. Meeting of the Pacific Tsunami Warning System Working Group 2 on Detection, Warning and Dissemination Task Team on PacWave11, Honolulu, USA, 21 May 2012 (**electronic copy only**)
 244. Sixth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 20–21 February 2013 (**Executive Summary in English, French, Russian and Spanish included**)
 245. Second Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Petaling Jaya, Malaysia, 16–18 October 2012 (**electronic copy only**)
 246. Seventh Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 12–13 February 2014 (**Executive Summary in English, French, Russian and Spanish included**)
 247. Third Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Hong-Kong, China, 6–7 April 2014 (**electronic copy only**)
 248. Tercera Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua, Nicaragua, del 29 al 30 de septiembre de 2014 (**Resumen dispositivo en español e inglés**)
 249. Workshop on Tsunami Modelling and Mitigation of the ICG/CARIBE-EWS Working Group 2: Tsunami Hazard Assessment, 1–3 December 2014, Cartagena de Indias, Colombia (**electronic copy only**)
 250. Fourth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Jakarta, Indonesia, 11–12 February 2015 (**electronic copy only**)
 251. Eighth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 12–13 March 2015 (**Executive Summary in English, French, Russian and Spanish included**)
 252. Ninth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems, UNESCO, Paris, 25–26 February 2016 (**Executive Summary in English, French, Russian and Spanish included**)
 253. Fifth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Manila, Philippines, 2–3 March 2016 (**electronic copy only**)
 254. Second Meeting of the Regional Working Group for the North West Indian Ocean (WG-NWIO), Tehran, Islamic Republic of, 27–28 February 2017 (**electronic copy only**)
 255. Sixth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Shanghai, China, 1–3 March 2017 (**electronic copy only**)
 256. Tenth Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 23–24 February 2017 (**Executive Summary in English, French, Russian and Spanish included**)
 257. First Meeting of the Group of Experts on Capacity Development (GE-CD), Paris, 21–23 March 2018 (**electronic copy only**)
 258. Eleventh Session of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG), Paris, 16–17 February 2018 (**Executive Summary in English, French, Russian and Spanish included**)
 259. Seventh Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Hanoi, Vietnam, 6–8 March 2018 (**electronic copy only**)
 260. Cuarta reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Managua (Nicaragua) el 11 de febrero de 2019 (**Resumen dispositivo y recomendación en español e inglés**)
 261. Eighth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), Jakarta, Indonesia, 4–6 March 2019 (**electronic copy only**)
 262. First Joint Meeting of the Task Teams of the IOC Group of Experts on Capacity Development: Capacity development requirements of Member States and implementation of a Clearing House Mechanism (CHM) for the Transfer of Marine Technology, UNESCO, Paris, 13–14 March 2019 (**electronic copy only**)
 263. Twelfth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XII), Paris, 21–22 February 2019 (**Executive Summary in English, French, Russian and Spanish included**)
 264. Seventh Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the Pacific Islands Countries and Territories (PICTs-WG), 8 March 2019, Noumea, New Caledonia (**electronic copy only**).
 265. Thirteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XIII), Paris, 20–21 February 2020 (**Executive Summary in English, French, Russian and Spanish included**)
 266. Second Meeting of the Group of Experts on Capacity Development (GE-CD), 26 October 2020, (online). (**electronic copy only**)
 267. Fourteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XIV), Online, 25–26 February 2021 (**Executive Summary in English, French, Russian and Spanish included**)

268. Eighth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the Pacific Islands Countries and Territories (PICTs-WG), 29 March–1 April 2021 (online)
269. Tenth Meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (SCS-WG), 28 and 30 September 2021 (online)
270. Fifteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XV), 24–25 February 2022 (online)
271. Quinta Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), 15 de noviembre de 2021 (En línea)
272. Sixteenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-XVI), Paris, 2–3 March 2023 (**Executive Summary in English, French, Russian and Spanish included**)
273. Sexta Reunión del Grupo de Trabajo Regional para América Central del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS), Heredia, Costa Rica, 24 de abril 2023 (**Executive Summary and recommendation in English included**)
274. Fifth Session of the IOC Group of Experts on Capacity Development (GE-CD), Paris, 27–29 February 2024
275. Twelfth Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS), Jakarta, Indonesia, 7 & 8 November 2024