

Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies



**Intergovernmental Coordination
Group for the Pacific Tsunami
Warning and Mitigation System
(ICG/PTWS)**

Twenty-seventh Session

Tahiti, French Polynesia
28–31 March 2017

UNESCO

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¹ The Executive Summary is available in French, Spanish and Russian.

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Executive summary

The Twenty-seventh Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVII) was held in Tahiti, French Polynesia, from 28 to 31 March 2017, chaired by the ICG/PTWS Chair, Ms Filomena Nelson (Samoa). The meeting was attended by 70 participants from 24 countries, and 7 Observer organizations.

The **ICG noted** the expertise that the Task Team on Evacuation Planning and Mapping has established with regards to this programme, as well as the interest in the new PTWS training course Tsunami Evacuation, Maps, Plans, and Procedures (TEMPP) and Tsunami Ready recognition among some Member States.

The **ICG recognized** the critical contribution of the Oceania Regional Seismic Network (ORSNET) to the PTWS and appreciating the French Government's contribution that helped establish this key network and the intention of the Vanuatu Government to continue to administrate the network pending availability of resources.

The **ICG requested** ORSNET Member Countries and other PTWS Members States to urgently seek funding resources with relevant development partners to sustain this important network.

The **ICG encouraged** the identification of resources and/or collaborations in order to implement a deep ocean sea level monitoring network in the South Eastern Pacific region.

The ICG **agreed** to organize an Exercise Pacific Wave 2018 (PacWave18) which will take place in the months of September through to November 2018 to support International Disaster Risk Reduction Day (13 October) and World Tsunami Awareness Day (5 November).

The **ICG recommended** Tsunami Service Providers (TSPs) and NTWCs use the Common Alerting Protocol (CAP) to facilitate the messages dissemination process.

The **ICG instructed** Working Group 2 to review the sensing network of the PTWS and develop an optimal (defined by functional, resourcing and capability requirements) multi-instrument design that integrates emerging techniques and sensor technologies (e.g. better use of tide gauges; GNSS technology and processing; sensors on telecom cables) with the existing sensing network to meet tsunami warning service requirements. This investigation should include cost-benefit analysis of the potential technologies being considered.

The **ICG instructed** Working Group 2 to establish by mid-2018 the minimum competency level for NTWC operations, by identifying (i) what competencies are required and (ii) what training schemes are currently in existence and what guidelines and principles can be adapted for this purpose; and report progress on this task to the PTWS Steering Committee.

The **ICG noted** that while Tsunami Service Providers (TSPs) will seek to monitor for, detect, and provide threat advice for all tsunamis within their respective areas of responsibility they will not always be able to provide guidance in sufficient time and/or accuracy in the case of local source tsunamis. Member States should fully consider this constraint in their local tsunami response SOPs. Therefore, ICG/PTWS countries should reaffirm the best mechanism for responding to local source tsunami is public education and ensuring their understanding and response to natural warning signs.

The **ICG decided** to establish a Task Team on Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) and Tsunami Ready, and approved Recommendation ICG/PTWS-XXVII.1.

The ICG **endorsed** the Northwest Pacific Tsunami Advisory Center's plan to begin issuing in experimental mode its new NWPTAC Enhanced products in 2017 **and approved** Recommendation ICG/PTWS-XXVII.2.

The **ICG decided** to commence the trial operation of the South China Sea Tsunami Advisory Center (SCSTAC) in late 2017, with a specific date to be decided by the PTWS Steering Committee, and approved Recommendation ICG/PTWS-XXVII.3.

The **ICG noted** with appreciation the tsunami forecasting products provided for the Member States of the PTWS by the PTWC hosted by the USA and the NWPTAC hosted by Japan, and training courses and mitigation materials by the ITIC, including decision support tools for hazard assessment, exercises, and event situational awareness.

The **ICG recommended** the PTWS Steering Committee examine the governance of the emerging structure of sub-regional warning networks and local forecast capabilities, to coordinate monitoring hazards and areas of service. The Steering Committee would develop revised definitions of service providers and recipients to reflect the new forecast, sensing, and warning capabilities of the PTWS, ensuring coordination of data and guidelines for service delivery in the basin; a draft Governance Service Model should be available for the ICG to review at its 28th session.

The **ICG encouraged** all participants to the ICG/PTWS develop and post documents for the next session as early as possible, preferably at least one month prior to the beginning of the session, for improved preparation for the session. Member States should make their presentation to plenary as brief as possible and to the point, to leave enough time for discussion among all participants to the session.

The **ICG endorsed** and **commended** the proposal of NOAA to conduct a two-year trial for the resumption of the RANET SMS AlertWatcher.

The **ICG decided** to hold joint inter-sessional meetings of Technical Working Groups, Sub-regional working groups, Task Teams and the Steering Committee.

The **ICG expressed its gratitude** to the Government of France and the Government of French Polynesia for kindly hosting the International Tsunami Workshop: Recent Tsunamis in the Pacific—Improving Tsunami Response and the 27th session of the ICG/PTWS in Tahiti, French Polynesia.

The **ICG accepted with appreciation** the kind offer of Nicaragua to host the 28th session of the ICG/PTWS in March or April 2019, over four days, with a one-day international scientific workshop immediately before the session.

The **ICG re-elected** Ms Filomena Nelson (Samoa) as Chair, and Mr Satoshi Harada (Japan), and Mr Wilfried Strauch (Nicaragua) as Vice-Chairs for the ICG/PTWS for the period May 2017–2019.

Résumé exécutif

La 27^e session du Groupe intergouvernemental de coordination du Système d'alerte aux tsunamis et de mitigation dans le Pacifique (GIC/PTWS-XXVII) s'est tenue à Tahiti (Polynésie française) du 28 au 31 mars 2017, et a été présidée par la Présidente du GIC/PTWS, Mme Filomena Nelson (Samoa). La réunion a rassemblé 70 participants de 24 pays et 7 organisations dotées du statut d'observateur.

Le GIC **a pris note** de l'expertise que l'équipe spéciale sur la planification et la cartographie des évacuations a mise en place en ce qui concerne ce programme, ainsi que de l'intérêt de certains États membres pour le nouveau cours de formation du PTWS intitulé Cartes, plans et procédures d'évacuation en cas de tsunami (TEMPP) et la certification « Tsunami Ready ».

Le GIC **a reconnu** la contribution essentielle du Réseau sismique régional Oceania (ORSNET) au PTWS et s'est félicité de la contribution du Gouvernement français à la mise en place de ce réseau clé et de la volonté du Gouvernement de Vanuatu de continuer d'administrer le réseau en attendant que des ressources soient disponibles.

Le GIC **a demandé** aux pays membres d'ORSNET et à d'autres États membres du PTWS de chercher d'urgence des ressources financières auprès de partenaires pour le développement concernés en vue d'appuyer cet important réseau.

Le GIC **a encouragé** le recensement de ressources et/ou de collaborations afin de mettre en place un réseau de surveillance du niveau de la mer en eau profonde dans la région du Pacifique Sud-Est.

Le GIC **est convenu** d'organiser un exercice « Vague du Pacifique » 2018 (PacWave18) qui se déroulera de septembre à novembre 2018 à l'appui de la Journée internationale de la réduction des risques de catastrophe (13 octobre) et de la Journée mondiale de sensibilisation aux tsunamis (5 novembre).

Le GIC **a recommandé** que les prestataires de services relatifs aux tsunamis et les centres nationaux d'alerte aux tsunamis utilisent le Protocole d'alerte commun (PAC) pour faciliter le processus de diffusion des messages.

Le GIC **a chargé** le Groupe de travail n° 2 de passer en revue le réseau de détection du PTWS et de mettre au point un projet multi-instruments optimal (défini par des critères fonctionnels et en termes de ressources et de moyens) qui intègre les techniques nouvelles et les technologies de détection (par exemple : meilleure utilisation des marégraphes ; technologie et processus des récepteurs GNSS ; capteurs sur câbles de télécommunication) au réseau de capteurs existant afin de répondre aux besoins en termes de services d'alerte aux tsunamis. Cette revue devrait inclure une analyse coût-avantage des éventuelles technologies envisagées.

Le GIC **a chargé** le Groupe de travail n° 2 de déterminer avant la mi-2018 le niveau minimum de compétences pour les opérations des centres nationaux d'alerte aux tsunamis, en recensant (i) les compétences nécessaires et (ii) les plans de formation existants et les directives et principes susceptibles d'être adaptés à cette fin ; et de faire rapport sur les progrès accomplis à cet égard au Comité directeur du GIC/PTWS.

Le GIC **a pris note du fait** que si les prestataires de services relatifs aux tsunamis s'efforcent d'assurer un suivi et une détection de tous les tsunamis relevant de leur champ de responsabilité et de fournir des avis sur les menaces qu'ils représentent, ils ne sont pas toujours capables de donner des orientations à temps et/ou suffisamment précises dans le cas des tsunamis de source locale. Les États membres devraient tenir pleinement compte de cette contrainte dans leurs procédures opérationnelles normalisées de réponse aux tsunamis locaux. Les pays du GIC/PTWS devraient

donc réaffirmer que le meilleur mécanisme de réponse aux tsunamis de source locale est l'éducation du public et veiller à ce que ce dernier comprenne les signes naturels précurseurs et agisse en conséquence.

Le GIC **a décidé** de mettre en place une équipe spéciale sur les Cartes, plans et procédures d'évacuation en cas de tsunami (TEMPP) et la certification « Tsunami Ready », et **a approuvé** la Recommandation GIC/PTWS-XXVII.1.

Le GIC **a entériné** le plan du Centre consultatif sur les tsunamis dans le Pacifique Nord-Ouest (NWPTAC), qui doit commencer à produire à titre expérimental ses nouveaux produits améliorés en 2017, et **a approuvé** la Recommandation GIC/PTWS-XXVII.2.

Le GIC **a décidé** de lancer la phase de test du Centre consultatif sur les tsunamis en mer de Chine méridionale (SCSTAC) fin 2017, la date précise de ce lancement devant être décidée par le Comité directeur du GIC/PTWS, et **a approuvé** la Recommandation GIC/PTWS-XXVII.3.

Le GIC **a pris note** avec satisfaction des produits de prévision des tsunamis fournis aux États membres du PTWS par le PTWC, hébergé par les États-Unis d'Amérique, et le NWPTAC, hébergé par le Japon, et des cours de formation et des documents sur la mitigation fournis par le CIIT, y compris des outils d'aide à la décision pour l'évaluation des risques, des exercices et une sensibilisation aux événements/situations.

Le GIC **a recommandé** que le Comité directeur du PTWS examine la gouvernance de la nouvelle structure de réseaux d'alerte sous-régionaux et de moyens locaux de prévision, en vue de coordonner le suivi des risques et les domaines d'intervention. Le Comité directeur élaborerait des définitions révisées des prestataires de services et des bénéficiaires de ces services pour tenir compte des nouveaux moyens du PTWS en matière de prévision, de détection et d'alerte, en assurant la coordination des données et directives pour l'exécution des services dans le bassin ; un projet de modèle de services en matière de gouvernance devrait être soumis à l'examen du GIC à sa 28^e session.

Le GIC **a encouragé** tous les participants du GIC/PTWS à élaborer et poster les documents pour la prochaine session dès que possible, de préférence au moins un mois avant le début de la session, en vue d'une meilleure préparation de celle-ci. Les présentations des États membres en vue de la plénière devraient être aussi brèves que possible et aller à l'essentiel, afin de laisser suffisamment de temps à la discussion pour tous les participants à la session.

Le GIC **a entériné** et **salué** la proposition de la NOAA de mener un test pendant deux ans en vue de la reprise de RANET SMS AlertWatcher.

Le GIC **a décidé** d'organiser des réunions intersessions conjointes des groupes de travail techniques, des groupes de travail sous-régionaux, des équipes spéciales et du Comité directeur.

Le GIC **a exprimé sa gratitude** au Gouvernement de la France et à celui de la Polynésie française d'avoir généreusement accueilli l'atelier international sur les tsunamis intitulé Tsunamis récents dans le Pacifique : Améliorer la réponse aux tsunamis et la 27^e session du GIC/PTWS à Tahiti (Polynésie française).

Le GIC **a accueilli avec satisfaction** l'offre généreuse du Nicaragua d'accueillir la 28^e session du GIC/PTWS en mars ou avril 2019, pendant quatre jours, avec un atelier scientifique international d'une journée immédiatement avant la session.

Le GIC **a réélu** Mme Filomena Nelson (Samoa) comme Présidente, et M. Satoshi Harada (Japon) et M. Wilfried Strauch (Nicaragua) comme Vice-Présidents du GIC/PTWS pour la période mai 2017-2019.

Resumen dispositivo

La 27ª reunión del Grupo Intergubernamental de Coordinación del Sistema de Alerta contra los Tsunamis y Atenuación de sus Efectos en el Pacífico (ICG/PTWS-XXVII) se celebró en Tahití (Polinesia Francesa) del 28 al 31 de marzo de 2017, bajo la presidencia de la Presidenta del ICG/PTWS, Sra. Filomena Nelson (Samoa). A la reunión asistieron 70 participantes de 24 países y 7 organizaciones en calidad de observadoras.

El ICG señaló los conocimientos técnicos que había generado el Equipo de tareas sobre elaboración de mapas y planificación para la evacuación en caso de tsunami en relación con este programa, así como el interés en el nuevo curso de formación del PTWS en materia de elaboración de mapas y planificación para la evacuación en caso de tsunami (TEMPP) y el reconocimiento de preparación para tsunamis entre algunos Estados Miembros.

El ICG reconoció la contribución clave de la red sísmica regional oceánica (ORSNET) al PTWS, y agradeció la contribución del Gobierno de Francia para ayudar a establecer esta red fundamental, así como la intención del Gobierno de Vanuatu de seguir administrando la red, de acuerdo con la disponibilidad de los recursos.

El ICG pidió a los países miembros de ORSNET y otros Estados Miembros del PTWS que buscaran con urgencia financiación con asociados para el desarrollo competentes, a fin de respaldar esta importante red.

El ICG instó a que se encontraran recursos y/o alianzas para poner en marcha una red de observación del nivel del mar en el mar profundo en la región del Océano Pacífico Sudoriental.

El ICG acordó organizar el ejercicio Pacific Wave 2018 (PacWave18), que se realizará entre septiembre y noviembre de 2018 con el fin de respaldar el Día Internacional para la Reducción de los Desastres (13 de octubre) y el Día Mundial de Concienciación sobre los Sunamis (5 de noviembre).

El ICG recomendó que los proveedores de servicios sobre tsunamis y el centro nacional de alerta contra los tsunamis (NTWC) emplearan el Protocolo de Alerta Común (CAP) para facilitar el proceso de difusión de mensajes.

El ICG pidió al Grupo de trabajo 2 que examinara la red de detección del PTWS y creara un diseño óptimo (definido de acuerdo con las necesidades funcionales, así como de recursos y capacidades) de varios instrumentos, que integrara técnicas novedosas y tecnologías de detección (por ejemplo, mejor uso de mareógrafos; tecnología y procesamiento del GNSS; y sensores en cables de telecomunicaciones) en la red de detección existente, a fin de cumplir los requisitos del servicio de alerta de tsunamis. Este examen deberá incluir un análisis de los costos y beneficios de las tecnologías potenciales estudiadas.

El ICG pidió al Grupo de trabajo 2 que estableciera, a más tardar a mediados de 2018, el nivel mínimo de competencias para las actividades del NTWC, definiendo i) las competencias necesarias, y ii) los esquemas de formación existentes y las directrices y principios que se pudieran adaptar para ello; y que informara sobre los avances en relación con esa tarea al Comité de Dirección del PTWS.

El ICG indicó que, aunque los proveedores de servicios sobre tsunamis procurarán observar las amenazas y detectarlas, y dar asesoramiento al respecto, para todos los tsunamis en las zonas de las que cada uno es responsable, no siempre podrán ofrecer orientación con antelación y/o precisión suficiente en caso de tsunamis de origen local. Los Estados Miembros deberán tomar debidamente en cuenta esta limitación en sus procedimientos normalizados de operaciones (SOP) de respuesta a tsunamis locales. Por tanto, los países del ICG/PTWS deberán reafirmar que el mejor mecanismo

para responder a los tsunamis de origen local es la educación pública, y asegurar que se comprendan las señales naturales de alerta y se respondan a las mismas correctamente.

El ICG decidió establecer un Equipo de Tareas sobre elaboración de mapas y planificación para la evacuación en caso de tsunami (TEMP) y el reconocimiento de preparación para tsunamis, y aprobó la recomendación ICG/PTWS-XXVII.1.

El ICG dio su respaldo al plan del Centro de Asesoramiento sobre los Tsunamis del Pacífico Noroccidental (NWPTAC) que consiste en comenzar a poner a disposición de forma experimental sus nuevos productos mejorados en 2017 y aprobó la recomendación ICG/PTWS-XXVII.2.

El ICG decidió comenzar el ensayo del Centro de asesoramiento sobre los tsunamis en el Mar de la China Meridional (SCSTAC) a finales de 2017, cuya fecha exacta decidirá el Comité de Dirección del PTWS, y aprobó la recomendación ICG/PTWS-XXVII.3.

El ICG tomó nota con satisfacción de los productos de predicción de tsunamis proporcionados para los Estados Miembros del PTWS por el PTWC acogido por los Estados Unidos de América y el NWPTAC acogido por el Japón, y los cursos de capacitación y materiales de atenuación brindados por el ITIC, en especial instrumentos de apoyo a la decisión para la evaluación de amenazas, los ejercicios, y la concienciación sobre ciertos hechos.

El ICG recomendó al Comité de Dirección del PTWS que examinara la gobernanza de la nueva estructura de las redes subregionales de alerta y las capacidades locales de predicción, para coordinar la observación de las amenazas y las zonas de servicio. El Comité de Dirección podría elaborar definiciones revisadas de los proveedores y receptores de servicios, a fin de plasmar las nuevas capacidades de predicción, detección y alerta del PTWS, garantizando la coordinación de los datos y las directrices para la prestación de servicios en la cuenca. Un proyecto de modelo de servicios de gobernanza deberá estar disponible para que el ICG lo examine en su 28ª reunión.

El ICG alentó a todos los participantes en el ICG/PTWS a que redactaran y publicaran documentos para la próxima reunión lo más pronto posible, de preferencia por lo menos un mes antes de su comienzo, para así poder prepararla mejor. Los Estados Miembros deberán procurar que su intervención en plenaria sea lo más breve y directa posible, con el fin de dejar tiempo suficiente para el debate entre todos los participantes de la reunión.

El ICG aprobó y encomió la propuesta de la NOAA de realizar un ensayo de dos años con miras a la reactivación de RANET SMS AlertWatcher.

El ICG decidió celebrar reuniones intermedias conjuntas de grupos técnicos de trabajo, grupos de trabajo subregionales, equipos de tareas y el Comité de Dirección.

El ICG expresó su agradecimiento al Gobierno de Francia y al Gobierno de la Polinesia Francesa por acoger amablemente el taller internacional sobre tsunamis: tsunamis recientes en el Pacífico – mejorar la respuesta a los tsunamis, y la 27ª reunión del ICG/PTWS en Tahití (Polinesia Francesa).

El ICG aceptó con agrado la generosa propuesta de Nicaragua de acoger la 28ª reunión del ICG/PTWS en marzo o abril de 2019, a lo largo de cuatro días, la cual comprenderá un taller científico internacional de un día de duración justo antes de la misma.

El ICG reeligió a la Sra. Filomena Nelson (Samoa) Presidenta, y a los Sres. Satoshi Harada (Japón) y Wilfried Strauch (Nicaragua) Vicepresidentes del ICG/PTWS para el periodo entre mayo de 2017 y 2019.

Рабочее резюме

Двадцать седьмая сессия Межправительственной координационной группы по Системе предупреждения о цунами и смягчения их последствий в Тихом океане (ICG/PTWS-XXVII) проходила на Таити (Французская Полинезия) с 28 по 31 марта 2017 г. под председательством г-жи Филомены Нельсон (Самоа), председателя МКГ/СПЦТО. В сессии приняли участие 70 представителей из 24 государств – членов МОК и семь организаций-наблюдателей.

МКГ приняла к сведению техническую документацию, подготовленную Целевой группой по вопросам планирования эвакуационных мероприятий и картирования зон эвакуации в отношении данной программы, а также заинтересованность некоторых государств-членов в организации новых учебных мероприятий СПЦТО по тематике картирования, планирования и процедур проведения эвакуационных мероприятий, связанных с цунами (КППМЦ), а также в получении сертификата «готовности к цунами».

МКГ отметила критически важную роль, которую выполняет в рамках СПЦТО Региональная сеть сейсмостанций Океании (ОРСНЕТ), выразив признательность правительству Франции за содействие в создании этой важнейшей сети, а также правительству Вануату за готовность продолжить административное обслуживание этой сети до поступления необходимых ресурсов.

МКГ просила государства, участвующие в ОРСНЕТ, и государства-члены СПЦТО в срочном порядке обратиться к партнерам в области развития с целью изыскания финансовых средств для обеспечения дальнейшего функционирования этой сети.

МКГ призвала определить источники финансирования и/или возможности партнерского взаимодействия с целью создания сети мониторинга уровня моря в глубоководных районах юго-восточной части Тихого океана.

МКГ постановила провести учения «Тихоокеанская волна-2018» (PacWave18), которые пройдут в сентябре-ноябре 2018 г. и будут приурочены к проведению Международного дня по уменьшению опасности стихийных бедствий (13 октября) и Всемирного дня распространения информации о проблеме цунами (5 ноября).

МКГ рекомендовала провайдерам данных слежения за цунами (ПДСЦ) и НЦПЦ использовать общий протокол оповещения о чрезвычайных ситуациях (ОПЧС), что позволит упростить процедуру распространения информационных бюллетеней.

МКГ поручила Рабочей группе № 2 провести обзор существующей сети датчиков СПЦТО и предложить оптимальную (с точки зрения функциональных возможностей, ресурсной базы и требуемого потенциала) конфигурацию системы мультиинструментального мониторинга, которая позволяла бы комбинировать существующий инструментарий контроля с новыми техническими средствами и датчиковыми технологиями (повышение эффективности использования мареографов, технологии зондирования и обработки данных ГНСС, установка датчиков на телекоммуникационные кабели и т.д.) в целях удовлетворения потребностей служб предупреждения о цунами. Это обследование должно включать анализ выгоды затрат предлагаемых к использованию технологий.

МКГ поручила Рабочей группе № 2 к середине 2018 г. разработать минимальные требования в отношении компетенций, связанных с деятельностью НЦПЦ, в которых должны быть указаны: (i) уровень требуемых компетенций и (ii) перечень используемых в настоящее время программ профессиональной подготовки, а также инструктивных материалов и методических рекомендаций, которые можно было бы адаптировать для этих целей, а также представить доклад о ходе выполнения этого поручения на совещании Руководящего комитета СПЦТО.

МКГ приняла к сведению, что провайдеры данных слежения за цунами (ПДСЦ) будут стремиться обеспечить мониторинг, выявление угроз и соответствующие рекомендации в отношении всех потенциальных цунами в зонах своей ответственности, но что при этом они, тем не менее, не во всех случаях смогут своевременно и/или с достаточной точностью обеспечить руководящие указания в отношении цунами, возникших под воздействием местных сейсмических очагов. Государствам-членам необходимо в полной мере учитывать этот аспект при разработке своих стандартных оперативных процедур (СОП), касающихся реагирования на цунами. В связи с этим странам, входящим в МКГ/СПЦТО, необходимо еще раз подчеркнуть, что самым эффективным механизмом реагирования на цунами местного происхождения является информационно-просветительская работа среди населения и обеспечение знания им т.н. «естественных тревожных признаков», а также умения соответствующим образом реагировать на эти признаки.

МКГ постановила учредить Целевую группу по картированию, планированию и процедурам проведения эвакуационных мероприятий, связанных с цунами (КППМЦ), а также сертификации готовности к цунами и утвердила Recommendation ICG/PTWS-XXVII.1.

МКГ одобрила план Консультативного центра по цунами в северо-западной части Тихого океана, предусматривающий направление с 2017 г. в экспериментальном режиме усовершенствованных продуктов (сообщений) НВПТАК и утвердила Recommendation ICG/PTWS-XXVII.2

МКГ постановила начать с конца 2017 г. (точная дата будет определена Руководящим комитетом СПЦТО) опытную эксплуатацию Консультативного центра по цунами в Южно-Китайском море и утвердила Рекомендацию ICG/PTWS-XXVII.3.

МКГ с удовлетворением отметила предоставление государствам-членам СПЦТО прогностической продукции о цунами со стороны Тихоокеанского центра предупреждения о цунами (ТЦПЦ), размещающегося в США, и Консультативного центра по цунами для северо-западной части Тихого океана (НВПТАК), размещающегося в Японии, а также предоставление Международным центром информации о цунами (МЦИЦ) технических руководящих документов, включая инструментальные средства поддержки принятия решений, касающихся оценки факторов риска, проведения учений и информирования о складывающейся обстановке.

МКГ рекомендовала Руководящему комитету СПЦТО рассмотреть аспекты, касающиеся управления новой структурой субрегиональных сетей раннего оповещения и прогностического потенциала на местах в целях координации мониторинга потенциальных угроз и согласования перечня предоставляемых услуг. Руководящий комитет подготовит пересмотренный вариант определений провайдера и получателя услуг с целью отражения в них новых возможностей СПЦТО в плане прогнозирования, обнаружения и предупреждения, а также в целях согласования данных и рекомендаций, содержащихся в представляемых в масштабах региона информационных продуктах. Проект рабочей модели управления оказанием услуг должен иметься в распоряжении МКГ с целью его рассмотрения на 28-й сессии МКГ/СПЦТО.

МКГ призвала всех своих членов подготовить и представить документы следующей сессии МКГ/СПЦТО в максимально короткие сроки, желательно не позднее, чем за месяц до начала сессии, с тем чтобы дать необходимое время для ее тщательной подготовки. Доклады государств-членов на пленарном заседании должны быть максимально краткими и касаться существа вопроса, что позволит высвободить время, необходимое для участия всех делегаций в последующей дискуссии.

МКГ одобрила и поддержала предложение Национального управления по исследованию океанов и атмосферы (НУОА) относительно двухгодичного экспериментального этапа возобновления функционирования системы РАНЕТ на основе SMS-оповещений.

МКГ постановила провести совместные межсессионные совещания технических рабочих групп, субрегиональных рабочих групп, целевых групп и Руководящего комитета.

МКГ выразила признательность правительству Франции и властям Французской Полинезии за любезное согласие провести на Таити (Французская Полинезия) международный научно-практический семинар на тему «Недавние цунами в Тихоокеанском регионе: повышение эффективности реагирования», а также 27-ю сессию МКГ/СПЦТО.

МКГ с признательностью приняла любезное предложение Никарагуа принять у себя 28-ю сессию МКГ/СПЦТО, которая пройдет в течение четырех дней в марте или апреле 2019 г. Непосредственно перед началом сессии пройдет однодневный научно-практический семинар.

МКГ переизбрала г-жу Филомену Нельсон (Самоа) в качестве председателя, а также избрала г-на Сатоши Хараду (Япония) и г-на Уилфрида Страуча (Никарагуа) в качестве заместителей председателя МКГ/СПЦТО на период с мая 2017 г. по май 2019 г.

1. WELCOME AND OPENING OF SESSION

1 Ms Priscille Frogier, Minister of Research of the Government of France/French Polynesia recalled the 1st April 1946 earthquake and tsunami originated at the Aleutian Islands, which devastated Hilo in Hawaii and killed two people in the Marquesas Islands, French Polynesia. She indicated French Polynesia is under tsunami risk and this meeting is an opportunity to strengthen tsunami preparedness in the region and for each Member State, including France/French Polynesia. She concluded wishing the ICG/PTWS session would provide practical recommendations for tsunami preparedness and mitigation. She thanked Chair Ms Filomena Nelson, UNESCO, ITIC and PTWC directors, and all the participants for their commitment to help strengthen people's security across the Pacific.

2 Mr Marc Tschiggfrey on behalf of the High Commissioner of the French Government for French Polynesia indicated that this meeting of experts is an opportunity to share experiences, techniques and information, and reinforce knowledge about tsunamis, to better approach its consequences and to better assess the risk that population is facing. For those who are in charge of Civil Protection the results of this work and studies, bringing together the knowledge and the experiences of research and practitioners, represents an asset to improve the security insofar as it will help to better quantify and forecast the phenomena.

3 Chair of the ICG/PTWS, Ms Filomena Nelson, declared open the 27th Session of the ICG/PTWS and thanked the authorities for sharing their views with the group and hosting the session. She also thanked to the Polynesian Tsunami Warning Centre (*Centre polynésien de prévention des tsunamis* CPPT) for hosting the [International Tsunami Workshop: Recent tsunamis in the Pacific \(2007-2016—Improving tsunami response](#), 27 March 2017, French Polynesia.

2. ORGANIZATION OF THE SESSION

2.1 ADOPTION OF THE AGENDA

4 The Chairperson informed the Plenary that the agenda was prepared by the Secretariat and the Officers in consultation with the PTWS Steering Committee taking into account the Recommendations and instructions given at the [Twenty-sixth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System \(ICG/PTWS-XXVI\)](#), 22–24 April 2015, Honolulu, United States.

5 The PROVISIONAL AGENDA **was approved** as presented, and is included as [Annex I](#).

2.2 DESIGNATION OF THE RAPPORTEUR(S)

6 The Chairperson informed Delegates that as per usual procedures a Rapporteur for the meeting needs to be appointed. She indicated that at the meeting of the PTWS Steering Committee held on Sunday 26 March 2017, the Chair was informed that USA may propose a candidate for Rapporteur. USA proposed Ms Jeniffer Lewis (USA) as rapporteur. The Plenary accepted this nomination.

2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION

7 The Chairperson noted that interpretation is not available for this session as agreed by the PTWS Steering Committee.

8 She further noted that as customary, all the documentation is available in the website of the meeting, in English.

9 The Chairperson informed the plenary that to guide the delegates an Annotated Agenda was provided, as document ICG/PTWS-XXVI/2 Prov

10 She informed the Plenary that in order to facilitate the proceedings of the meeting a Timetable was prepared by the Secretariat in coordination with the Officers, the local organizing committee and the PTWS Steering Committee.

11 She noted that a deadline for nominations of candidates for Officers had been set to Wednesday 29 March at 5 pm and a deadline for submission of Draft Recommendations through the Secretariat had been set to Thursday 30 March at 6 p.m.

12 At this point, she offered the floor to the local hosts. Mr Dominique Raymond and Mr Francois Schindel  provided logistic detailed information including about two field trips that have been organized. The first one on Thursday 30 March afternoon, to visit the Centre Polyn sien de pr vention des tsunamis (CPPT), and the second one on Saturday 1st April, around Tahiti island, that includes a visit of the areas impacted by tsunamis generated by the earthquakes at Aleutian Islands, 1946, Chile 1960 and 2010, and Tohoku 2011.

13 She then proposed to the Plenary to constitute two statutory sessional groups that following nominations of Member States were composed as follows:

- Elections Commission: Chair Mr David Coetzee (New Zealand) with members from France and USA.
- Recommendations Committee: Chair Dr Francois Schindel  (France) with members from Australia, China, Japan, New Zealand and USA.

14 In order to smooth the work of the session and facilitate the generation of recommendations and agreements, the plenary set up four intrasessional Working Groups to address some of the major issues addressed at the meeting, as follows:

- PacWave 19: Chair Dr Laura Kong (ITIC, USA) with members from Australia, China, New Zealand, USA and Vanuatu
- Working Group 2: Chair Ken Gledhill (New Zealand) with members from Australia, China, Republic of Korea, Samoa, USA and Vanuatu.
- Working Group 3: Chair Mr David Coetzee (New Zealand) with members from China, Colombia, Cook Islands, France, Samoa, Solomon Islands, USA and ITIC
- Task Team on Future Goals and Performance Monitoring+ Finance: Chair Mr Rick Bailey (Australia) with members from Japan, New Zealand, Samoa, USA, Vietnam and ITIC.

15 The following regional Working Groups also met in intrasessional meetings, with the Member States present and attending the session:

- South West Pacific Regional Working Group
- South East Pacific Regional Working Group
- Central America Pacific Coast Working Group

16 Ms Nelson indicated that due to limited time available the sessional Working Groups should meet outside the times of the plenary session and coordinate the booking of designated rooms with the Secretariat.

17 At this point, the Chairperson asked Mr Rajendra Prasad, member of the IOC Secretariat, to inform the meeting about the forth-coming Election of Officers, and reminded the ICG of the deadline for nominations by Member States, according to IOC Rules of Procedure. He reported that according to the rules, one Chair and two Vice-Chairs should be elected with candidatures accepted until EOB of the first day of the session, which was set for 5 pm on Wednesday, 29 March 2017.

18 The Chairperson requested that the time used to reporting is reduced as much as possible to concentrate on the exchange of views and decisions on policy matters. She asked Member States to deliver as much as possible national reports without PowerPoint presentations (PPTs), and the PPTs be provided to the Secretariat for posting to the website.

19 The Chairperson opened the floor for comments from Delegates on the timetable. The timetable was approved as is.

3. REPORT ON INTERSESSIONAL ACTIVITIES

3.1. CHAIRPERSON'S REPORT

20 Chair Filomena Nelson presented her report for the intersessional period 2015–2017 (May 2015 to February 2017).

21 Ms Nelson indicated that after the 26th Session of the ICG/PTWS and the celebration of the 50th Anniversary of the PTWS in Honolulu, Hawaii, kindly hosted by the US Government, there have been a lot of progress, despite the challenges with time and resources and the obstacles encountered along the way.

22 During the intersessional period a number of activities were implemented in Member States, by National Tsunami Warning Centres and Disaster Management Offices. As well by Working Groups and Task Teams, and the Tsunami Service Providers (TSPs). She highlighted some of the key achievements within the intersessional period. One of these is the successful implementation of the Tsunami Ready pilot program in Honduras following the decision of the PTWS Steering Committee at its meeting in July 2016 for the Technical Working Group 3 to find out more about the Tsunami Ready by running a pilot program in the countries that expressed interest.

23 The planning and execution of [PacWave 16](#) and [PacWave 17](#) exercises is another key achievement by the ICG that needs acknowledgement as it took a lot of effort, time and energy from the Task Team members to put together the scenarios, compile the coordinating instructions and develop evaluation surveys post-PacWave, simulations and reports.

24 She also highlighted progress made by the Task Team established under the Steering Committee as per the decision made at the 26th Session to focus on the development of the future goals and performance monitoring framework for the PTWS as well as the national report template.

25 The Chairperson also noted progress made to date by the Task Team for the establishment of the South China Sea Advisory Tsunami Center, under the Working Group for the South China Sea region, and the progress made by the [Northwest Pacific Tsunami Advisory Center](#) (NWPTAC) in developing its enhanced products for the North West Pacific.

26 She reported that during the intersessional period, two PTWS Steering Committee meetings were held. She noted that the Steering Committee is critical to setting the pace and direction of implementation of the decisions of the ICG and as a check point to discuss any

issues and monitor the progress of implementation of recommendations from the ICG Sessions.

27 She recalled that the 26th Session of the ICG PTWS placed a lot of emphasis on tsunami preparedness and mitigation, harmonisation of ICG governance and operations to ensure consistency, establishing standards and guidelines for tsunami warning and mitigation systems. Also on alignment of the ICG's strategic direction and aspirations with the global disaster risk management frameworks such as the [Sendai Framework for Disaster Reduction 2015-2030](#). As the Chair of the ICG, she would like to see ICG efforts for the next intersessional period to continue on this path, to focus more on preparedness and mitigation programs to further strengthen existing national and local tsunami preparedness and risk reduction programs, such as the Tsunami Ready program.

28 She encouraged all Member States represented at this session to contribute actively to the discussion and raise issues to help guide the future developments and strategic goals to further strengthen coordination of tsunami related work in Member States through national tsunami warning centres and civil protection agencies.

29 The full text of her report is available in ANNEX III.

30 The **ICG noted** the report of the Chairperson.

3.2. SECRETARIAT REPORT

31 The Technical Secretary for ICG/PTWS, Mr Bernardo Aliaga and Mr Rajendra Prasad, UNESCO/IOC National Programme Officer for Disaster Risk Reduction & Tsunami Warning, based in Fiji, presented the report of the Secretariat focusing on actions led or coordinated by the Secretariat during the intersessional period 2015–2017, including extrabudgetary funded projects.

32 Mr Aliaga reported that the regular budget of IOC for its tsunami programme is organised around three lines that correlate with the three pillars of the [PTWS Medium Term Strategy](#). On Pillar 1—Risk Assessment and Reduction, with a total available for PTWS of USD 19,000 for 2016–2017, the Secretariat organized two workshops. The [Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China Sea region](#), 16–18 November 2015, Xiamen, China, and the [Experts Meeting “Tsunami Hazard in Central America: Historical Events and Potential Sources”](#), 23–24 June 2016, Costa Rica. A follow up meeting to the former was also organized, in Hanoi in February 2017.

33 On Pillar 2—Detection, Warning and Dissemination, with a total available for PTWS of USD 22,000 for 2016–2017, the Secretariat provided support to ICG and WGs meetings. It included this 27th session, a PTWS Steering Committee meeting in 2016, two meetings of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region, two meetings of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the Southwest Pacific. Remote support was also provided to the Regional Working Groups on Tsunami Warning and Mitigation System in the Central American Pacific Coast, and to the Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region. The Secretariat is also responsible of keeping an updated database of NTWC/TWFP/TNC including contact details, follow up of PTWC and NWPTAC Communication Tests and promotion of seismic and sea level data sharing.

34 On Pillar 3—Awareness and Response, with a total available for PTWS of USD 14,000 for 2016–2017, the Secretariat provided support to ITIC TEMPP and presented a successful

proposal to the DIPECHO project's call for Central America, which was funded by [European Commission's Humanitarian Aid Office](#) (ECHO) with USD 578,000. It also presented a proposal to UN ESCAP in partnership with ITIC, involving South West Pacific countries but it was not funded.

35 Mr Aliaga reported that annual funding contributions from China, Republic of Korea and New Zealand have been provided through the IOC Special Account for activities of the PTWS, which is much helpful. Similarly, several PTWS training and workshops were consistently supported by USA through the [National Oceanic and Atmospheric Administration](#) (NOAA) and the [Office of Foreign Disaster Assistance the United States Agency for International Development](#) (USAID/OFDA).

36 Mr Rajendra Prasad, UNESCO/IOC staff based in Suva, Fiji, reported that he has been supporting Pacific SIDS to develop/review National Tsunami Response Plans and Standard Operating Procedures (SOP). The documents are being updated in light of PTWS enhanced products and service change that came into effect in October 2014.

37 He reported regional and in-country training, with the support of the ITIC, on Tsunami Warning and Response utilizing the PTWS enhanced products. Two of them have been regional trainings and recent focus is on in-country training. Training for Cooks Islands, Solomon Islands, Tonga and Vanuatu was completed in 2015-2016 with Fiji and remaining Pacific SIDS to follow during 2017–18. Training for Federated States of Micronesia, Marshall Islands and Palau was done with the help of US NOAA/NWS and the [Secretariat of the Pacific Community](#) (SPC).

38 Mr Prasad indicated support is being provided to Pacific SIDS through the work of PTWS Working Groups and Task Teams to improve seismic and tsunami detection, data exchange, warning, information dissemination and response. For example, IOC is supporting work of three Task Teams established at the [Fourth Meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the Southwest Pacific](#) (ICG/PTWS WG-SWP-IV), 22–23 August 2016, Honiara, Solomon Islands, to deal with improving local tsunami response, develop competency guidelines for tsunami operational personnel and pilot Tsunami Ready Programme in one to three Pacific SIDS. He noted the relevant contribution of Oceania Regional Seismic Network (ORSNET) for seismic data exchange in the region and noted that the development of response and mitigation plans for tsunami has paved the way for improvements of plans for other natural threats. He reported that Nauru has joined the IOC and is in the process of establishing its own meteorological service.

39 Samoa inquired about the status of sea level data availability through GTS for stations located in the South West Pacific region. Rick Bailey (Australia) reported that all sea level data is going through GTS and is available. One problem on data latency has been found and investigations are ongoing to solve it.

40 Vanuatu thanked the support and inquired how IOC can support in terms of funding for data sharing. Mr Aliaga informed how the Caribbean Sea Level stations was improved in 9 years from 16 to 78 stations with support from several donors and in kind contribution from Member States including Brazil, France, Monaco, Saint Vincent & the Grenadines, and USA NOAA/NWS & USAID. He suggested that defining a set of core stations needed for an effective detection of tsunamis may help guiding donors to focused contributions if they are associated with national commitments for maintenance and repairs. Mr Prasad indicated that the Secretariat is available to cooperate to put together funding proposals for international agencies to support improvement of networks.

41 The **ICG noted** the report of the Secretariat.

3.3. REPORT FROM INTERNATIONAL TSUNAMI WORKSHOP: RECENT TSUNAMIS IN THE PACIFIC (2007-2016)—IMPROVING TSUNAMI RESPONSE

42 The Chairperson recalled the International Tsunami Workshop hosted immediately before this session, which had focused on the analysis of the results of the new forecast methods implemented by the [Pacific Tsunami Warning Center](#) (PTWC) and the [Japan Meteorological Agency](#) (JMA) and the innovative methods implemented by tsunami warning centres. Also, on the lessons of the tsunami response during the last decade and the initiatives for improvement.

43 Dr Francois Schindel  (France) and Mr Rick Bailey (Australia) provided a summary of the [International Tsunami Workshop: Recent tsunamis in the Pacific \(2007-2016\) - Improving tsunami response](#), 27 March 2017, French Polynesia, organized by the IOC of UNESCO, the International Union of Geodesy and Geophysics (IUGG) and its Tsunami Commission, and the “Centre Polyn sien de pr vention des tsunamis” (CPPT).

44 They recalled that many tsunamis affected the Pacific during the last decade. From those the November 14, 2016 Mw 7.8 Kaikoura (New Zealand) earthquake and tsunami was very complex, partly inland, with uplift of shorelines. This event and others provided some additional lessons on how to use sea level data to confirm the tsunami threat. The Tohoku 2011 major earthquake was recorded by the Japan GNSS network and has also provided key information to further explore on how to use GNSS data in SOPs, including which parameters could be of use (slip, vertical, horizontal). The workshop also noted that Solomon Island is impacted by frequent events (every 3 years), which also affect New Caledonia due to amplification phenomena. The workshop reflected Chile’s good response of the National Tsunami Warning Center—NTWC, the [Hydrographic and Oceanographic Service of the Navy](#) (SHOA) and the Disaster management organization -DMO [Chilean National Office for Emergency](#) (ONEMI) during recent 2014 and 2015 events.

45 On detection, warning and forecast the main subject addressed was how to build and maintain comprehensive tsunami detection networks (“Next Generation Sensing Grid”) including Geophysical (seismometers, accelerometers, GPS stations) and sea level networks (tide gauge, tsunameters like [Deep-ocean Assessment and Reporting of Tsunamis](#) DART  , cable, GPS, radar). Data sharing and sustainability that implies cost reduction were also addressed and methods to fast forecast tsunami height and tsunami run-up were discussed. Among them, fast focal mechanism and Mw magnitude computation (W_Phase,PDFM) and Fast amplitude computation on shore (modified Green’s law, nested grids – long computation).

46 The workshop discussed about near field tsunamis and problems related with the forecast/warning for these events. Among them how to utilize forecast and interpret accuracy in short time scales, how to interpret intensity scale for large shaking earthquakes, non or barely felt [tsunami earthquakes](#) and over warning in [strike-slip](#) events. It also noted that there is lack of data and experience about methods of detection and forecast for non-earthquake generated tsunamis, including meteo-tsunami and submarine landslide/volcano generated tsunamis.

47 On preparedness, the workshop was impressed by the Tsunami Ready initiative success and noted the TEMPP Pilot completion led by ITIC. It noted that self-evacuation works better in countries with recent history of large tsunamis, including Chile for the Mw 8.3 16 September 2015 earthquake and tsunami. It noted the positive experience of New Zealand enhanced public education campaign and also noted that orderly responses/evacuations are very important and requires education, exercises, signage, and existence of evacuation maps. Samoa emphasized that community engagement is essential in the process of establishing and strengthening of the TWS, tsunami hazard mapping, and contingency planning, noting that communities place a lot of value on recognition of their input and expertise by the government.

The workshop noticed that focus is now moving toward community based preparedness programmes.

48 The **ICG noted** the report of the workshop.

3.4. TOWS-WG REPORT

49 Under this agenda item, Mr Rick Bailey (Australia) informed to the Plenary that two meetings of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) have been held in the intersessional period: the [Ninth meeting of TOWS-WG](#) held in Paris, France, the 25 and 26 February 2016 (IOC/TOWS-WG-IX), and the [Tenth meeting of TOWS-WG](#) held in Paris, France, the 23 and 24 February 2017 (IOC/TOWS-WG-X). He summarised the main aspects of IOC/TOWS-WG-X.

50 He recalled that the main objective of TOWS-WG is to advise the IOC Governing Bodies on coordinated development and implementation activities on warning and mitigation systems for tsunamis and other hazards related to sea level of common priority to all Intergovernmental Coordination Groups on Tsunami Warning and Mitigation Systems (ICGs/TWSs). Because of that, TOWS-WG reports directly to the IOC Assembly/Executive Council.

51 Mr Bailey reported that the TOWS-WG-X was held in Paris, France, on 23–24 February 2017 under the Chairmanship of Mr Alexander Postnov (IOC Vice-Chair, Russian Federation). The ICG/PTWS is represented by the Chair of the ICG or delegates, as for this meeting the two ICG/PTWS Vice-Chairs Mr Rick Bailey (Australia) and Mr Tomoaki Ozaki (Japan). He recalled that the Chair of the Task Team for Disaster Management & Preparedness (TT DMP) is David Coetzee (New Zealand) and Laura Kong (ITIC) is the second representative from ICG/PTWS, and the Chair of the Task Team for Tsunami Watch Operations (TT TWO) is Chip McCreery (USA) and Tomoaki Ozaki (Japan) is the second representative from ICG/PTWS. Two PTWS countries are also WG members, which are the USA and Chile.

52 The TOWS-WG X meeting evaluated progress in actions and decisions taken by the Governing Bodies through Decisions IOC-XXVIII/8.2 and IOC EC-XLIX/3.4, noting with satisfaction the completion of the PTWS TEMPP Pilot course in Honduras and the expected availability of the course documentation to ICGs noting the interest of the CARIBE-EWS and IOTWMS.

53 The TOWS-WG recommended the Assembly to encourage Member States to:

- Sustain and increase technical and financial support of the tsunami warning systems in their respective regions;
- Further promote tsunami awareness in communities and among authorities through communication and tsunami wave exercises, training, information, and community preparedness and recognition programmes;
- Share Tsunami source scenario data as well sea level data relevant to tsunami detection and alerts;
- Densify sea level networks particularly nearby tsunamigenic sources;
- Extend exercises to community level and include critical infrastructure in exercises (e.g. hospitals, fire stations, police stations, electric power plants, airports, ports and harbours);

54 The TOWS-WG recommended the Assembly to instruct ICGs:

- to consider piloting the CARIBE EWS Tsunami Ready guidelines and report back to the TOWS-XI with a view to develop harmonized consistent global guidelines;
- to advocate the [World Tsunami Awareness Day](#) (WTAD) among member states and advise them of the availability of material from the [United Nations Office for Disaster Risk Reduction](#) (UNISDR) in this regard, and share activities and materials with UNISDR and Tsunami Information Centers (TICs);
- to recommend TSPs and NTWCs to also use the Common Alerting Protocol (CAP) to facilitate warning messages to be consistently disseminated simultaneously over many warning communication systems to many applications;
- to recommend TSPs and NTWCs register with international register of alerting authorities through the [World Meteorological Organization](#) (WMO) National Permanent Representative;
- to consider contributing any education or outreach materials related to data buoy vandalism to the Data Buoy Cooperation Panel (DBCP) for inclusion in a tool kit of regionally relevant materials to counter vandalism;
- the ICG/PTWS, in line with the IOC XXVII Assembly decision 8.2, to continue its work on the Key Performance Indicators (KPI) to cover all aspects of the Tsunami Warning and Mitigation Systems, aligning as closely as possible with the [Sendai Framework for Disaster Reduction 2015-2030](#), and share it to the other ICGs for consideration by the Member States, and report back to TOWS XI with a view to establish global KPIs;
- to encourage NTWCs disseminate tsunami bulletins to ports, harbours and other maritime authorities within their countries;
- to share the results of Tsunami exercises and communication tests with WMO to facilitate improved performance of WMO related communication systems;

55 The TOWS-WG recommended the Assembly to take the following actions:

- to conduct a symposium in early 2018 in Paris on enhancing existing TSP and NTWC operational tsunami forecasting to further develop warning products and enhancing timely, accurate, reliable and effective decision-making and community response, involving experts from monitoring networks, seismology, tsunami forecast modelling and warning centres, maritime authorities, and national and local emergency management authorities with advice on product requirements;
- to extend the tenure of TOWS and its Task Teams on (i) Disaster Management and Preparedness (TTDMP) and (ii) Tsunami Watch Operations (TTTWO), with ToRs as given in IOC Resolution XXIV-4 [for TOWS-WG] and IOC/TOWS-WG-VI/3 [Annex II; for TTDMP] and modified ToRs for TTTWO to reflect work related to enhancements to the accuracy and effectiveness of tsunami forecast information for users

56 The TOWS-WG accepted the reports from the Task Teams on Disaster Management and Preparedness and Watch Operations and instructed the Task Team on Watch Operations:

- to develop in consultation with the [World-Wide Navigational Warning Service Sub-Committee](#) (WWNWS-SC) specific tsunami threat messages for vessels at sea;
- to consider tsunamis generated by non-seismic sources for integration into Tsunami watch operation;

57 The TOWS-WG noted the information presented by WMO on the new developments on the [WMO Information System](#) (WIS) and its use for dissemination of Tsunami alerts as well as WIS performance monitoring of messages and particular types of messages.

58 The TOWS-WG recommended WMO to explore rendering assistance to CARIBE-EWS concerning usage of Global Telecommunication System (GTS) and WIS for dissemination of tsunami alerts in the Caribbean region.

59 The TOWS-WG recognized that the current financial situation strongly limits the implementation of the tasks of TOWS-WG, ICGs and Inter-ICG Task Teams and recommended Member States to increase their extra-budgetary contributions to the IOC to provide the needed resources for the priorities identified by TOWS-WG and ICGs.

60 Mr Bailey suggested the ICG/PTWS to consider and incorporate the recommendations from the TOWS-WG in the work plans of the ICG in the next inter-sessional period including adoption and adaptation of the various guidelines being developed by the TOWS-WG to implement best-practice and ensure harmonisation across the four tsunami warning and mitigation systems and their respective ICGs.

61 The **ICG noted** the report on TOWS-WG.

3.5. WARNING & ADVISORY SERVICES REPORT

3.5.1. Pacific Tsunami Warning Centre (PTWC)

62 The PTWC Director, Dr Charles McCreery (USA), gave his report on the intersessional activities of PTWC as PTWS TSP. He showed maps of the over 600 seismic and over 300 sea level stations currently contributing data to PTWC. He noted that PTWC had responded to >5000 global earthquakes that triggered PTWC seismic alarms, had issued 665 Observatory Messages for larger earthquakes >~5.5 Mw, and had issued PTWS Tsunami Bulletins for 88 Pacific earthquakes ($M_w \geq 6.5$) of which 71 Tsunami Information Statements and 17 Tsunami Threat Messages.

63 Dr McCreery recalled that this report covers the first full two-year intersessional period of the new PTWC criteria and products, with 17 Threat Message Events, 4 Earthquakes with $M_w \geq 7.9$, 12 for Local Tsunami Threat and 1 Tsunami with an initial Information Statement only.

64 On events that triggered the issue of Tsunami Threat Messages, he highlighted two most significant events: Central Chile Sept 16, 2015 with initial $M_w 7.9$ (M_w CMT 8.3) and New Zealand, Feb. 13, 2016, with initial $M_w 7.4$ (M_w CMT 7.9), both generating local tsunami inundation.

65 He noted that for PTWC one event posed a challenge, which was an earthquake which generated an unexpectedly large tsunami for a $M_w 6.9$ and that triggered an Information statement only. He noted that this is a reminder for PTWS about the difficult confirmation of local events in absence of near epicenter sea level gauges.

66 Director PTWC provided some results of Performance Indicators (PIs) for the period, following the definition of PIs by the Inter-ICG Task Team on Tsunami Watch Operations as follows:

- Elapsed Time from Earthquake to Initial Product: ~6 minutes for the last two years
- Accuracy of the Epicenter Location: ~15 km

- Accuracy of the Earthquake Magnitude (Mw): magnitude residuals 0.2-0.3 with regional biases
- Accuracy of the Earthquake Depth: for 108 events Mean Offset of 21.5 km and Median Offset of 11.2 km
- Accuracy of the Tsunami Forecast: Examined for 5 Events: 2007 Kuril, 2009 Samoa, 2010 Chile, 2011 Tokoku, and 2014 Chile. Forecast compared to observations at 80 stations located along open coasts (not inside protected bays or estuaries). Total number of comparisons: 215. Average L1 Error = 32%
- Reliability (Down Time): 0%

67 During the intersessional period, PTWC conducted its regular monthly scheduled communication tests with very few problems reported, and issued scheduled messages for the PacWave16 and PacWave17 Exercises. It also issued two unscheduled communication tests. He showed the statistics collected for the February 28, 2017 unscheduled communication test as follows:

- 20 of 52 PTWS Countries/Territories responded
- 23 of 73 Designated TWFP & NTWC responded
- 47 of 66 Faxes successful
- 287 of 291 Emails successful

68 The test messages seem to have been distributed quickly and comprehensively by GTS, AFTN, [Emergency Managers Weather Information Network](#) (EMWIN) and Email, but there was close to a 30% failure rate of the faxes and less than 40% of the countries and territories responded to the tests as requested. Improvements are needed in those two areas.

69 Dr. McCreery reported that the older PTWS website (<http://ptwc.weather.gov>) is being retired and replaced with a merged US domestic plus international tsunami information website (<http://tsunami.gov>) that is displaying all US domestic and international products including PTWC's CARIBE-EWS and PTWS products. He noted that the combined site is still under development to facilitate easy access to international products and related information for both the PTWS and CARIBE-EWS. He welcomed feedback on the web site in order to make it most useful to PTWS customers.

70 Lastly, Dr McCreery noted that PTWC actively participated in the PacWave16 and PacWave17 Exercises. It also continued with development of new operations software for both PTWC and US NTWC and announced that as of April 3, 2017, domestic responsibility for tsunami alerts to Puerto Rico and the Virgin Islands had been transferred from the US NTWC to PTWC for a more uniform service across the entire Caribbean.

71 New Zealand noted that Member States' expectations about the service of TSPs is increasing as more data becomes available, however, for local events it is difficult for TSPs to provide a timely response. In those cases NTWCs have to do on their own, in particular for the first response.

72 Dr McCreery recalled that TSPs transitioned from providing warnings to provide advisory services. However some countries depend upon that advice more than ever. He indicated that due to scientific challenges and the very local nature of procedures for near-field events Member States should have its own local procedures and use TSPs information to help define the threat—but take decisions according to local plans defined in advance.

73 Samoa inquired about the availability at PTWC of seismic data from stations that have been installed by China in the South West Pacific, that are not available through the international networks. Dr McCreery indicated that as of the middle of last summer seismic data for countries like Samoa is available and this is very much appreciated.

74 Australia requested that data from Samoa and all countries in the region is made available to all countries, to improve the ability to make forecasts.

75 Tonga requested that the PTWC Enhanced Products be uploaded onto EMWIN for redundancy and for NTWCs to be more robust given they rely only on internet and fax and those mechanisms may go down in case of an event. Director PTWC indicated that Text products are on EMWIN but the graphical products are not because the EMWIN is a public source. EMWIN can transmit these graphical products but it would require the ICG/PTWS to reconsider these products be made public.

76 Australia noted that the rate of answer to PTWC announced test is very low. He asked if that is that the same with PacWave exercises? Dr Kong (ITIC) responded that in terms of exercises the responses from NTWCs are timely. Dr McCreery recalled that unannounced tests are random and they are meant to get a measure if countries are going to respond in case of a real event.

77 Chair Ms Nelson encouraged Member States to please respond to TSPs' Communication Tests as TSPs spend a lot of time and resources to organise and run them.

78 The **ICG noted** the report of PTWC.

3.5.2. Northwest Pacific Tsunami Advisory Center (NWPTAC)

79 Mr Daisuke Marumoto (Japan), Scientific Officer, Earthquake and Tsunami Observation Division, Seismology and Volcanology Department, [Japan Meteorological Agency](#) (JMA) presented the report of the [Northwest Pacific Tsunami Advisory Center](#) (NWPTAC).

80 He introduced that NWPTAC issued advisories for 49 major earthquakes in the northwestern Pacific region during the period of April 2015–February 2017. Most of the advisories were sent within 30 minutes after the occurrence of the respective events. NWPTAC has issued the advisories for 221 events in total since the commencement of its service in March 2005.

81 Mr Marumoto reported that NWPTAC sends messages to 43 fax numbers and 89 e-mail addresses overseas, from 16 recipient countries. To examine the communications status on distributing the advisories, NWPTAC started to conduct regular communications tests twice a year since 2012. The communications tests were implemented three times during this period and the last one was conducted on 17 January 2017. Owing to assistance from the Secretariat and Member States, the condition has been maintained in a decent level. Recently, the percentage of fax numbers that received the message successfully reached close to 80% and that percentage for e-mail addresses seems higher. However, 5 of 16 recipient countries were unresponsive to the test messages in the last test.

82 He expressed that for further detailed and comprehensive investigation, NWPTAC would like to request more countries to participate in the communications tests.

83 With respect to the question expressed by New Zealand on expectations of Member States from TSPs, Mr Harada (Japan) indicated that for local events it is up to the countries to use advisories, to resolve and provide awareness to their citizens. For local tsunamis, people

most probably will feel the earthquake that generates the tsunami and in that case people should have been told in advance what to do.

84 The **ICG noted** the report of NWPTAC.

3.6. REPORT FROM THE INTERNATIONAL TSUNAMI INFORMATION CENTER (ITIC)

85 The Chair invited the Director of UNESCO/IOC's [International Tsunami Information Center](#) (ITIC), Dr Laura Kong to present her [report](#).

86 The ITIC Director reported on activities of the ITIC during the inter-sessional period, April 2015 to March 2017. ITIC's annual international work plan is developed with the IOC and NOAA according to the needs and priorities of the ICG/PTWS and other ICG and Member State requests. A significant amount of ITIC's time was dedicated to support training of the PTWC Enhanced Products, and the piloting of the new PTWS course Tsunami Evacuation, Maps, Plans, and Procedures ([TEMPP](#)). The PTWS Task Team on Evacuation Planning and Mapping provides guidance to TEMPP, and is reported in Agenda 3.10.

87 ITIC organizes and conducts in-country training on all aspects of tsunami warning and mitigation in order to help countries build and implement their national programs ([ITP-International](#)). Country trainings were organized and conducted by the IOC and ITIC in Colombia, Cook Islands, Peru, Solomon Islands, Tonga, and Vanuatu in the Pacific, regionally for the Caribbean hosted by Barbados, and in Honduras for TEMPP. In 2013, the ICG/PTWS requested the ITIC to explore the feasibility of distance learning. During the 2016 PTWS Steering Committee, the ITIC reported that it had placed some materials on the [IOC IODE Global Teacher Academy](#) site. Further feasibility testing with IODE is planned for the next intersessional period.

88 The 2015 ITIC Training Program in Hawaii ([ITP-Hawaii](#)) was not conducted due to the priority focus on in-country training (ITP-International, see below). ITP-Hawaii 2016 was held 6–16 September. The training was participated by 10 participants from five countries (China, Mexico, Nauru, Tonga, and USA). From 2015–2017 based on requests, 10 one-week ITP-International and 3 US domestic training/workshops were conducted, with nearly 600 trained in total.

89 For the 2008–2010 SOP Strengthening Project for Indian Ocean and Southeast Asia, ITIC and partners developed from scratch extensive training materials and templates for operational tsunami warning and emergency response. To summarize the contents, NZ, ITIC, and the ICG/IOTWMS Secretariat collaborated to publish the IOC Manual and Guide, *Plans and Procedures for Tsunami Warning and Emergency Management, Guidance for Countries in Strengthening Tsunami Warning and Emergency Response through the Development of Plans and Standard Operating Procedures for their Warning and Emergency Management Authorities* (to be published). As part of the TOWS WG Disaster Management and Preparedness Task Team actions, ITIC has available [Tsunami Response Training for Businesses](#), including hotels. A Training Manual based on global best practices and including tsunami response standard operating procedures templates was developed as part of a 0.5-day course.

90 ITIC, along with the [US NOAA Caribbean Tsunami Warning Program](#) (CTWP), and the IOC, piloted the PTWS [TEMPP](#) course in Honduras in Spanish in 2015-2017. The Pilot also invited Central America and Mexico countries to join the training. The course, based on global best practice examples, builds in-country capability to create practical reliable tsunami evacuation maps through a series of five linked training workshops on inundation mapping, evacuation mapping, response planning, and exercises. TEMPP course materials will be

finalized in 2017, and an IOC Manual on Tsunami Evacuation Maps, Plans, and Procedures is expected in 2018. The USAID Office of Foreign Disaster Assistance (OFDA) and NOAA were the primary funding sources.

91 The TEMPP process enabled one community, [Cedeño](#) on the Pacific Coast of Honduras, to meet the guidelines for it to be recognized as the 1st Pacific IOC-UNESCO Tsunami Ready community. The Tsunami Ready recognition program is discussed further in Agenda 4.4. The Tsunami Ready guidelines, first approved in the Caribbean, are now being piloted in the Pacific, with the view of developing a global guideline. As a result of TEMPP, Costa Rica will recognize its first community (Pacific) in May 2017.

92 The ITIC Director summarized the status of [tsunami warning decision support and hazard assessment tools](#) available to Member States. CISON, Tide Tool, Tsunami Travel Time (TTT), Tsunami Historical Database, and Tsunami Bulletin Board continue to be supported by the US, and the [IOC Sea Level Station Monitoring Facility](#) by IOC.

93 ITIC worked with the NOAA Center for Tsunami Research (NCTR) to make available tsunami inundation modeling tools ([ComMIT](#) using MOST) to support evacuation mapping as part of the TEMPP Project, and to develop a standalone [Tsunami Coastal Assessment Tool \(TsuCAT\)](#) to assist countries in tsunami exercise and response planning, and early national tsunami warning decision-making. A standardized ComMIT training course, with tutorials and hands-on exercises, is now available for teaching, on request and subject to funding (brochure distributed). In 2016-2017, to meet requests from Pacific Island countries and the IOC, the NCTR and ITIC developed TsuCAT to provide national agencies with a quick and easy way to obtain scenario-based guidance (1-page information sheet and User's Manual distributed). TsuCAT provides access to the NOAA Pacific, Caribbean, and Indian Ocean pre-computed database of tsunami modeling results. Simulations for historical tsunami sources from ICSU/WDS-MGG/NOAA NCEI and the U.S. Geological Survey earthquake archive are also included. TsuCAT was demonstrated to ICG/PTWS participants during the lunch break on 29 March 2017.

94 ITIC supported the 1st UN [World Tsunami Awareness Day](#) (WTAD) by participating as a speaker and moderator at the UN Asian Ministerial Conference for Disaster Risk Reduction (AMCDRR, India), and distributed awareness materials at AMCDRR, Caribbean World Tsunami Awareness Day (at Special Committee Meeting of the Disaster Risk Reduction and Transport of the Association of Caribbean States, Trinidad and Tobago), and the Japan-sponsored Tsunami High School Summit (Japan). An ITIC 2-minute explainer [video](#) was also created, and was shown at the High School Summit.

95 From April 2015 to February 2017, 47,567 copies of [ITIC awareness and decision support tools](#) were distributed, with 18,112 distributed to the PTWS (excluding USA). ITIC updated four existing materials (Tsunami Glossary, Global Tsunami Sources, Significant Earthquakes, Volcanic Eruptions), and created three new products. To support the TEMPP Project and Honduras' tsunami awareness, ITIC and CTWP created Tsunami Family Emergency Cards—the cards were adapted from the US National Tsunami Hazard and Mitigation Program and translated into Spanish for the Cedeño tsunami drill. ITIC and NCEI created a historical tsunami map for Central America and the Adjacent Region (English, Spanish) and tsunami historical effects maps for Hawaii (2016) and American Samoa/Samoa/Tonga (2017).

96 Since 2015, ITIC has been under a staffing shortage resulting in delays in several of its services. ITIC continues to maintain a library on tsunamis and publish a Newsletter per its 1977 Functions (IOC-X.23). Library collection growth is based on donations, and web mining. The database is offline containing more than 9000 records, but updates have not been made for several years. The [ITIC Tsunami Newsletter](#) for Pacific countries is published

quarterly, electronically, through the Tsunami Bulletin Board and ITIC web site, and in hard copy, with distribution to about 450 addresses, but is current only through April 2015. Post-event assessments, triggered by tsunami threat >1m amplitude forecast to 1 or more countries, followed by tsunami damage, are supported by ITIC at the request of the IOC. Assessment reports of the 11 March 2011 tsunami and the 16 September 2015 Mw 8.3 Northern Chile tsunami are still being finalized, due to staffing shortages at both IOC and ITIC.

97 With ITIC's move to a larger office in the NOAA Inouye Regional Center in 2013, ITIC is again able to host long-term visits through the ITIC Visiting Experts Program, dormant since the 1980s. Visitors can assist ITIC with its work plan, conduct collaborative country projects with the ITIC / PTWC, or receive more in-depth operations training. Since 2014, the ITIC has annually hosted three-month internships from the [University of Tokyo Ocean Alliance Program](#).

98 All international capacity building and other activities for the PTWS and other regions are provided through extra-budgetary support. The ITIC Director reiterated that present and past funding have never been sufficient to provide full services, and reminded Member States to include funding in their national budgets, especially for training.

99 Chile commented on the importance of the TEMPP and Tsunami Ready pilot project and thanked ITIC for its hard work in those projects. It suggested that Member States are provided with the Tsunami Ready guidelines to use it because it is a very simple list, which provide useful and concrete guidance for tsunami preparedness at local level.

100 Samoa, Solomon Islands and Tonga noted there are SOP training needs for South Pacific SIDS countries. Samoa indicated it understand that there are limitations with respect to funding but would ask if the US sponsored Voluntary Cooperation Programme (VCP) [Pacific International Training Desk](#) can introduce tsunami training elements. Tonga also inquired about the possibility of sending staff from South West Pacific meteorological offices to ITIC for training.

101 Mr Ray Tanabe (USA, NWS Pacific) indicated that there is a possibility of including tsunami elements in the Pacific International Training Desk that has already added a couple of days for tsunami training. However, it was developed to help mainly with weather forecasting. He noted that US continues to support the two-week ITIC Training Program (ITP-Hawaii) but emphasized that the current funded Pacific International Training Desk is focused on weather training, not tsunami.

102 ITIC Director indicated that TsuCAT was done as a response to requirements from South West Pacific countries to have a tool that could assist Member States in their threat analysis especially for local tsunamis. TsuCAT was built with modular GIS architecture, making it possible to add other data or analysis layers. NOAA PMEL/NCTR indicated that adding historical records is possible. ITIC requested feedback on TsuCAT in order to guide improvements in the tool.

103 The **ICG noted** the report of ITIC.

3.7. NATIONAL PROGRESS REPORTS

104 The Chair reminded the session that written reports have been requested in a standard format, and have been received in advance of the Session. They have been made available through the meeting website. He asked Delegates to make short statements focussed on key points of their National Reports that may have implications for the policy discussion.

105 Australia indicated that it remains committed to the free and real-time exchange of the seismic and sea level data it collects in the region to support all Member States, and especially

the US and Japan Tsunami Service Providers (TSPs) supporting the PTWS. Australia has its own tsunami warning capability at the [Joint Australian Tsunami Warning Centre](#) (JATWC), which continues to work closely with national emergency and disaster management agencies and authorities to ensure national tsunami warning services meet the requirements of users and stakeholders. Australia participates in both ICG/PTWS and ICG/IOTWMS, providing a Tsunami Service Provider (TSP) service for the Indian Ocean. Australia is presently updating its national PTHA and undertaking further inundation mapping for selected locations..

106 Canada indicated that the [Canadian Hydrographic Service](#) continues to maintain 17 continuously operating water level stations capable of recording tsunamis on Canada's Pacific coast. Four are specifically for the tsunami warning system along with the 13 other Permanent Water Level Network (PWLN) stations. The [Geological Survey of Canada](#), part of the Earth Science Sector of Natural Resources Canada (NRCAN), contributes real-time seismic data from 37 broadband seismographs stations to the PTWC and to the US NTWC. [Ocean Networks Canada](#) (ONC) at the University of Victoria has tsunami bottom pressure recorders and ocean bottom seismographs at major node sites along its NEPTUNE 850 km fiber optic cable loop off the west coast of Canada. Data from these instruments are available continuously in real-time.

107 The Canadian Hydrographic Service is strengthening the National existing observational Permanent Water-Level Network (PWLN) and its associated data acquisition, quality control and data dissemination systems. This will provide real time robust observational data feeds.

108 Two small seismically generated tsunamis and one small meteorological tsunami were recorded on Canada's Pacific coast during the inter-sessional period. They were from earthquakes in Chile (16 September 2015, Mw 8.3) and the Solomon Islands (8 December 2016, Mw 7.8) and a storm surge / meteotsunami from Typhoon Songda (14 October 2016).

109 Subsequent studies after the 28 October 2012 (M=7.7) Haida Gwaii quake have indicated along the southern portion of this fault off Moresby Island a change in margin orientation compared to the direction of relative plate motion, thus requiring a component of convergence. This type of oblique convergence is usually accommodated by a combination of thrusting nearly at a right angle to the margin with expected strike-slip faulting further landward (Cassidy, Rogers, Hyndman, 2014). Epicentre location along this fault will be critical for tsunami warnings. Shore observations indicated significant local run-ups exceeding 7 m in some of the small inlets along the west coast of Haida Gwaii (possible maximum of 13 m). This area does not have any permanent water level stations.

110 [Emergency Management BC of the province of British Columbia](#) (EMBC) is the provincial agency for distributing tsunami warnings to coastal stakeholders and takes the lead in tsunami public education. EMBC regularly conducts Provincial Emergency Notification System tests with coastal stakeholders. In June 2016 EMBC led Exercise Coastal Response, a full scale earthquake and tsunami response exercise that tested and acted upon critical elements of the BC Earthquake Immediate Response Plan. EMBC also conducted High Ground Hikes in Coastal Communities.

111 Chile indicated that during the inter-sessional period, the Chilean NTWC ([Sistema Nacional de Alarma de Maremotos](#)—SNAM) developed the following: (i) on 2015 a new gauge was installed, being the #40 in total. All of them open to the public in the IOC SLMF; (ii) in November 2015 new Operational Center facilities were inaugurated. Its layout in three different levels with a video wall in the front which allows to the officer in charge a better and wider view of all the components and sensors during the emergency; (iii) As part of a Chile-USA joint effort, since October 2015, three new [Deep-ocean Assessment and Reporting of Tsunamis](#) DART @ 4G buoys were launched in the Chilean waters, completing five systems in total; (iv)

SIPAT, the Chilean DSS, started its operation on May 2016, giving a threat tsunami assessment with a database of +5,000 pre-modelled scenarios. The system chooses the worst case scenario for each forecast point and defines a threat level for the whole country, which is divided in 21 polygons; (v) As part of SHOA's training program, NTWC staff attended in 2015 and 2016 to a Diploma hosted by Pontificia Universidad Catolica of Valparaiso: "Tsunami in the South American coast of the Pacific Ocean: scientific bases, threat and vulnerability"; (vi) NDMO [Chilean National Office for Emergency](#) (ONEMI) has run several simulation in all the regions. The latest one was in the Valparaiso region, in commemoration of the WTAD 2016, where around 500,000 were evacuated to safe zones. Also communication test (daily) and simulations (every three months) has been run between ONEMI, the National Seismological Center and SHOA; and (vii) As part of SNAM training program, tsunami drills are run every day in SHOA facilities, in order to test SOPs and prepare watchstanders for real events.

112 Colombia reported it has done very important improvements in the technical capacities, on disaster management preparedness, and risk reduction. Some of the more relevant actions are the following:

- The implementation of a new methodology for the elaboration of hazard, vulnerability, and risk tsunami mapping and tsunami studios.
- Enhancements to the Tsunami Numerical simulation with HySEA using GPU technology.
- The implementation of a Database for local events with 12 tsunami inundation scenarios for the Colombian Caribe Sea, 8 of them for Cartagena.
- The Strengthening of tools for communication, dissemination, and response during a tsunami emergency.
- And finally, the adoption of an enhanced Protocol for the attention of tsunami events that effectively link national and regional authorities.

113 China provided a [written report](#).

114 Federated States of Micronesia (FSM) reported that prior to 2014, the FSM government did not have any Tsunami warning system implemented within the overall early warning system. During the PTWS Enhanced Products introduction campaign, Dr Laura Kong (ITIC) visited all four-island States and with her help FSM developed the Weather Service Offices (WSOs) tsunami SOPs. This SOP would then be adopted by the State and National government to be the framework for the tsunami warning system.

115 The WSOs were designated to be main tsunami monitors for islands because of its 24 hour operation schedule. An MOU was drafted between the state Governors and the WSOs to be able to issue tsunami statements out of the WSO offices. WSOs have been receiving a lot of support from PTWC, NWPTAC, ITIC and NOAA Pacific Region to be able to carry out this task. An example would be the installation of the [Tide Tool](#) kit and the CISN in all FSM WSO stations. And WSOs are also participating in the Pacific Sea Level Monitoring Project, by BOM Australia.

116 FSM indicated that early February, on the island of Pohnpei, the Governor's office has dedicated tsunami safe-zones around the island and installed safe-zone signage and evacuation routes. They hope that by the end of this summer, all islands, especially the remaining three (3) main island States would have their designated tsunami safe-zones.

117 France presented a [written report](#) and a specific [presentation about the Polynesian Tsunami Warning Centre](#) (CPPT) and the [Civil Protection Warning and Emergency plan in French Polynesia](#).

- 118 New Caledonia, a French territory with increased independency, reported it has its own Civil Defense. They have updated its TWFP data and established a technical advisory board. They noted concerns about tsunami warning information and response plans for cruise ships, considering they are getting about 500 cruise ships per year. In December 2016 the Maritime Rescue Coordination Centre (MRCC) notified a cruise but it did not respond to the warning. They inquired if there are studies and experiences about threat threshold for cruise ships. ITIC indicated that tsunami threats for ports need specific modelling. This is also a concern in the Caribbean. There are some site-specific tools and ongoing studies about thresholds in the US.
- 119 Japan reported that JMA started to use new offshore pressure gauges, i.e., 125 gauges of S-net installed by the [National Research Institute for Earth Science and Disaster Prevention \(NIED\)](#) and 31 stations of DONET installed by the [Japan Agency for Marine-Earth Science and Technology \(JAMSTEC\)](#), to JMA's tsunami warning operation on 28 July 2016. Regarding public education, JMA prepared a glossary of JMA's tsunami warnings/advisories in English, Chinese, Korean, Portuguese and Spanish which serves as guideline for tsunami warning transmitters in 2015. JMA also conducts a nation-wide earthquake disaster mitigation exercise around the WTAD with a wide range of participants. With regard to international cooperation, [Japan International Cooperation Agency \(JICA\)](#) is now conducting Technical Cooperation Projects regarding tsunami monitoring capacity for the Republic of Nicaragua and Ecuador.
- 120 Malaysia reported that it was hit by shallow earthquake of magnitude 6.0 on 5 June 2015 with epicentre at Ranau, Sabah, East Malaysia. In 2016, Malaysia had installed another 15 seismic stations in Sabah and expected to be completed in middle of 2017. Malaysia is now in process of developing building codes for the country. Malaysia continues increasing capability in disseminating earthquake information and tsunami early warning from 10 minutes in 2015 to 8 minutes in 2016. Malaysia had concluded an inundation modelling study for some tsunami risk areas in Peninsula Malaysia and Sabah. Recognizing the high potential of the Manila Trench to generate tsunami, Malaysia had carried out tsunami drill in 2016 at Putatan, Sabah. Other than that, also in 2016, Malaysia had developed Tsunami Emergency Response Plan for Kudat, Sabah.
- 121 Mexico highlighted its participation in five international Tsunami drills, as well as in seven national Tsunami drills in the last three years (2015-2017). On March 1st, 2016 an alternative Tsunami Warning Center became operational in Veracruz Port (low seismic region), giving operational continuity to the National Tsunami Warning Center. This year sea level monitoring stations were increased in 44 stations, becoming 134 stations in 4 networks for the entire country. A National Tsunami Warning Communication System was installed last year. It includes 75 communication nodes all over the south pacific coast. It includes both Tsunami Warning centers.
- 122 Nauru reported they have just join IOC on the 4 September 2015. The Secretary for National Emergency Services (NES) is recognized as the TNC and TWFP. Once the Meteorology Services is established and up and functioning, the focal point roles will be handed to the Meteorology office. A National emergency Operation Center (NEOC) is expected to be in place with JICA funding support including training. Tsunami evacuation drills are implemented in schools in Nauru, with 20 minutes evacuation time, knowing three hours are required for a tsunami to reach Nauru in case of a tsunami generated in New Hebrides trench. IOC and ITIC have supported developing SOP. Nauru requested more capacity building and training from IOC.
- 123 New Zealand provided a [written report](#) and a [presentation](#) on the November 14, 2016 Mw 7.8 Kaikoura event. They also reported that a DART ® buoy that washed up on the shores of New Zealand was retrieved.

- 124 Nicaragua reported that the Instituto Nicaragüense de Estudios Territoriales ([INETER](#)), a governmental institution which is the largest geosciences institution in Central America with 400 co-workers, 40 of them in the Geophysical Department identifies tsunamigenic events. The seismic activity is monitored by the seismic data centre at INETER (24x7, 2 watch persons) using online data from 88 stations in Nicaragua, around 100 stations from other countries in Central America and around other 200 stations worldwide. Data processing is carried out by a number of SeisComp3 systems. The Operation Centre of Civil Defense and [SINAPRED](#) have a graphical client of INETER's SeisComp3 which presents in real time the graphical (Epicentral Map) and alphanumeric information of the occurring seismic events. First seismic event characterizations should be available within 1 minute for events in Nicaragua. Tsunami warning should be declared within 5 minutes
- 125 Nicaragua recalled the 25th anniversary of the tsunami which affected the Nicaraguan Pacific Coast on the 1st September 1992. This disastrous event was the trigger for the successful development of the tsunami warning and mitigation system which exists today in Nicaragua.
- 126 The delegate of Nicaragua explained that the National Tsunami Warning Center at the [Instituto Nicaragüense de Estudios Territoriales](#) (INETER) is the starting point for the Central America Tsunami Advisory Centre (CATAC) which is now under development. He thanked the cooperation of the Central American countries which provide seismic data in real time for CATAC. He also thanked for the technical assistance of Japan which has started a project with Nicaragua on the reinforcement of the CATAC including capacitation, technical assistance, purchase of equipment and software.
- 127 Nicaragua informed that INETER in cooperation with the [Swiss Seismological Service](#) is establishing a pilot Earthquake Early Warning (EEW) system for Nicaragua and Central America. EEW produces extremely rapid locations and magnitude determination which could be interesting for tsunami warning in those areas where the local tsunami waves reach the coast only a few minutes after the earthquake. Also, near real time Shakemaps are important for the tsunami response as evacuation and mitigation measures should take into account the affectations possibly suffered due to the earthquake.
- 128 Palau noted that the Disaster Security Council (DSC) of Palau is receiving PTWC and NWPTAC messages. They noted that it has been recommended to DSC to develop SOPs for local and regional threats including for tsunamis.
- 129 Panama reported it has been participating continuously in the last five years in the tsunami drills of both the Pacific Wave and the Caribe Wave to test communications between the PTWC and the Panama Alert Center, [Institute of Geosciences](#), University of Panama. In the exercises, the communication between the Alert Center and the Emergency Operations Center of Panama at the [Sistema Nacional de Protección Civil](#) (SINAPROC) was tested. In addition, during the last two years evacuation exercises have been carried out in coastal communities threatened by tsunami impact.
- 130 The authorities of the current government have been made aware of the need to strengthen the National Center for Alerts of earthquakes and tsunamis of Panama, the Institute of Geosciences, University of Panama. The annual increase of broadband stations, for the seismic network, has been maintained for the last five years and for the next five years it has been contemplated the purchase and installation of five more to complete 15 broad band stations and 50 more of short period seismic stations for the purpose to generate shake maps in near real time.
- 131 The acquisition of three tide gauges for the Pacific and three more for the Caribbean of Panama is planned for the coming years. The purchase of this equipment has been proposed

to be carried out by the electric transmission company of Panama, a purchase that has not materialized yet. Seismic monitoring network personnel have been increased in three more operators and Panama hopes to continue with the support of a national security agency that has personnel that will be trained to be able to operate 24/7.

132 Panama has participated in the TEMPP course offered by UNESCO-COI, ITIC, NOAA, and COPECO, as it was mentioned by Dr Laura Kong (ITIC), and with the experience gained in this course a first flood map for two coastal communities of the Caribbean of Panama has been made. For the next five years, Panama plans to build a database of tsunami propagation models for known historical seismic sources and inundation maps, safe areas and evacuation routes for all coastal communities threatened, with the knowledge gained in TEMPP courses.

133 Republic of Korea indicated that [Korea Meteorological Administration](#) (KMA) is responsible for earthquake and tsunami monitoring. To monitor earthquakes in and around the Korean peninsula, KMA operates a seismic network with 156 stations and is planning to increase the number to 210 by the end of this year. They also receive seismic data from 50 stations of other domestic organizations, and 32 stations from JMA and 12 from NIED, as well. Regarding the sea level observation, KMA operates only one monitoring system on Ulleung Island. However they share tidal gauge data from the [Korea Hydrographic and Oceanographic Administration](#) to monitor tsunami. KMA obtains tsunami information from PTWC and NWPTAC, as well. The information is very helpful for them to make a decision on distant tsunamis.

134 When an earthquake with magnitude greater than 7 occur in the surrounding seas of the Korean peninsula, we investigate tsunami arrival times and wave heights along the local coast using pre-calculated tsunami database and assess if tsunami can affect the peninsula. When the wave height is expected to be over 0.5 m, tsunami advisory is issued. And the wave height is expected over 1 m, tsunami warning is issued.

135 KMA conducts tsunami drill every two months to evaluate the tsunami warning and notification system. In the drills, KMA analyses the magnitude and location of a scenario earthquake and searches for tsunami height and arrival time in some major coastal areas as quickly as possible, and reports this information to the organizations concerned. After that, KMA collects the returned messages from the organizations and analyses them. They use pre-calculated tsunami database for tsunami information. Republic of Korea is also developing real-time tsunami warning system to predict tsunami heights and arrival times to South Korea due to tsunami in the Pacific Ocean, similar to 2011 Tohoku tsunami. This tsunami warning system consists in mainly two stages: One is to analyse fault parameters and slip distribution on the fault plane and the other is to simulate tsunami propagation and to calculate tsunami heights and arrival times on the coast. This system is now under performance test.

136 There was no tsunami affected Korea peninsula during last two years. But last year, they had a moderate earthquake with local magnitude of 5.8. This may be one of small events for other countries, but this was the largest earthquake in Korea for the last 40 years. This earthquake induced great impact on Korean society and much change has been undertaken in seismological society. It has not been much change in the field of tsunami, but hopefully it would positively affect to the field of tsunami as well, in terms of infrastructure or research.

137 Russian Federation presented a [written report](#).

138 Samoa presented a [written report](#).

139 Solomon Islands indicated that earthquakes are frequent in the region. They are therefore working hard on enhanced preparedness through monthly community preparedness drills, mapping and evacuation planning. ComMIT training is under preparation and

discussions are ongoing with UNDP to reinforce community preparedness. Increased preparation at community level is required including through awareness, broadcasting, and radio communicating system including siren activation in specific communities.

140 The Delegation of Tonga reiterated Tonga's extreme vulnerability to local tsunami in particular and highlighted that the First Pacific Meeting of Ministers of Meteorological Services (PIMMS) in Nuku'alofa, Tonga in July 2015 recognizes that the Pacific region is highly prone to tsunami with several countries having recently experienced locally generated tsunamis, requiring rapid detection and prompt dissemination of tsunami warnings to coastal communities and therefore the need to strengthen Early Warning Systems for this hazard.

141 Tonga mentioned that it participated in PacWave 17 Exercise and confirmed that there remains gaps in tsunami awareness, SOPs within first response agencies, communication between agencies, tsunami hazard mapping and evacuation and informed the meeting that the government is planning to conduct a nationwide tsunami exercise in late 2017. Tonga relies heavily on internet based communications for the receipt of earthquake and tsunami advisory products and there is a need to have a backup satellite feed. Under the Pacific Resilience Project (PREP) funded by the World Bank, Tonga plans to upgrade its seismic network as well as establish a new volcano monitoring network. Under that same project a multi-hazard early warning system will be established as well as improved communications. On the warnings side Tonga needs assistance to review its national tsunami warning procedures, access to quicker earthquake fixes and establish minimum warning competency levels. JICA is also assisting Tonga establish a more robust alerting system, activation for sirens and upgrade to AM transmission station.

142 United States of America reported primary accomplishments as follows:

- Support of IOC TEMPP project. U.S. is pleased to have contributed both personnel and product support to the Tsunami Evacuation Mapping Plans and Procedures project during the intersessional period. As a prototype, demonstration capability NOAA's Tsunami Program was able to apply R&D funds to this effort—the first time NOAA has committed Tsunami R&D funding to a dedicated community preparedness activity. This is in line with the U.S. effort to apply equal focus on improving both tsunami warning operations, and facilitating community preparedness.
- Improved messaging and forecast consistency. Combined U.S. NTWC/PTWC website: <http://tsunami.gov>; PTWC assumes responsibility for both International and domestic bulletins in Caribbean as of 3 April 2017.
- Developed Post Tsunami Survey Protocols: Led the development of the U.S. Post-Tsunami Survey Protocol as an ongoing coordinated U.S. Federal Agency effort with State partners.
- Facilitated improved forecast availability to TNCs. The U.S. through USAID/OFDA, will support and implement a Tsunami SMS Notification Pilot Project for two years to assist developing countries, in particular Small Island Developing States (SIDS), with a heads-up alert mechanism for tsunamis.

143 United States of America also reported on the following ongoing thrust areas:

- Develop and Deploy Sustainable, Reliable Detection. Consider alternatives to the costly, DART ®-only detection network to transition to a more sustainable multi-sensor/multi-national sensing strategy. Sensing capability has advanced rapidly in recent years to the point where we can now augment the U.S. DART ® array by (1) leveraging International DART ® locations, (2) taking advantage of improved seismic density including, (3) incorporating submarine cable

observations, (4) incorporation of the wphase CMT analysis for source inversion (5) development of GNSS-based source estimate technique, (6) relying more on coastal tide gauges supported by digital elevation models, and (7) investigating non-traditional sensors such as coastal radars.

- Improve Forecast accuracy. Reduce uncertainty in forecasts through (1) more accurate source characterization and (2) development and incorporation of coastal flooding models. Facilitated through ongoing testbed between US TWCs and NOAA's Pacific Marine Environmental Lab.
- Better Prepared Communities. Increase focus on community preparedness tools to support both domestic and international customers. US recognizes the imperative of these activities, which is not a choice, as noted by the PTWS Chair.
- Develop protocols to address Non-seismic Sources tsunami waves. Consider how best to leverage existing capabilities to develop non-seismic source tsunami alerting procedures.

144 Vanuatu indicated its NTWC is the [Vanuatu Meteorology and Geo-Hazards Department](#). Tsunami detection system has been upgraded with 4 sea level gauges since 2015 and 11 seismic monitoring stations, eight additional seismic stations to be added in 2017. Vanuatu coordinates the ORSNET project to ensure consistent seismic data sharing for tsunami warning in the South West Pacific region. The Vanuatu Tsunami disaster Management preparedness and risk reduction resources are developed and installed for the main cities through the engagement of the community particularly the tsunami risk and evacuate on mapping, tsunami signage and tsunami siren. The relevant Tsunami drill exercise is planned for 2017.

145 Vietnam presented a [written report](#).

3.8. WORKING GROUP REPORTS

146 Dr Francois Schindel  (France), Chair of the Working Group on Tsunami Hazard Assessment reported that the Group has not met in the intersessional period. He reflected on what should be the activities in case this group is re-conducted and reminded the three major inputs to establish tsunami hazard assessment: (i) recent, historical and paleo-tsunami data ; (ii) modelling, from source to inundation using worst case scenario or deterministic methods; (iii) post tsunami survey for recent tsunamis (observations, tsunami records, video, photos). He highlighted that in several cases recent tsunamis data and observations could be the first step to assess the tsunami hazard. He noted that near field and far field sources should be considered separately and mentioned new methods that are developing as Probabilistic tsunami hazard assessment (PTHA). He noted that recent tools used for tsunami threat forecast are similar to those in use for tsunami assessment studies.

147 Australia, China, New Zealand, Tonga and USA intervened to reflect on the need or not of the continuity of this Working Group under ICG/PTWS, or moving this task under the TOWS-WG. The ICG consensually was of the view that the contributions of this Working Group are still required to support conducting regional sources hazard assessments and contributing to reinforce countries' capabilities in this field, in particular for SIDS.

148 Dr Ken Gledhill (New Zealand), Chair of the Working Group on Tsunami Detection, Warning and Dissemination reported on the inter-sessional work of the group. He indicated two major achievements in the area covered by this working group are the implementation of the Enhanced tsunami information Products by PTWC and NWPTAC and the success of seismic data sharing in the South-west Pacific with the establishment of the Oceania Regional Seismic Network (ORSNET). The success of ORSNET has added 26 stations to coverage in the region with this data now available to PTWC. This has hugely increased seismic data

availability in the region and those involved are to be commended for a job well done. However, the system now needs to be further developed and sustained.

149 He indicated that once the enhanced tsunami information products are in place (reported under item 4.5) we must start to think about verification and performance and start working on version 2.0.

150 Looking to future developments, Dr Gledhill suggested PTWS need to ask TSPs to move to provide tsunami messages in Common Alerting Protocol (CAP). This will allow machine to machine message handling and enhance end-to-end tsunami messaging. Many Member State alerting systems are now using CAP.

151 Another issue highlighted by Dr Gledhill is the expectations on service providers (PTWC and NWPTAC). Now there is more data available for detection it is possible for the service providers to provide information on regional and local source events. We must therefore define what the expectations are, otherwise expectation will continue to grow which cannot be delivered effectively. This is likely to be a global issue as well as one for the ICG/PTWS.

152 He emphasized that new techniques are now being tested for the detection of tsunami, with an example being GNSS technology presented at the [International Tsunami Workshop: Recent tsunamis in the Pacific \(2007–2016\)—Improving tsunami response](#). We need to start thinking about how we integrate these new techniques into the watch operations at our service providers and National Tsunami Warning Centres (NTWC).

153 Dr Gledhill recalled that training and certification has been discussed in other working groups and at the PTWS Steering Committee in 2016. There is a case for introducing certification into the requirements for NTWCs, and this is a matter which needs discussion.

154 Finally, what is the relationship between this PTWS working group and the similar task team at the global level? What should be the role of this working group going forward? Dr Gledhill invited delegates to contribute actively to the intra-session discussions about these items.

155 Ms Esline Garaebiti (Vanuatu), Chair of the Task Team on Seismic Data Sharing in the South West Pacific reported on the activities of this Task Team. She indicated that the [4th Meeting of PTWS WG 2 Task Team on Seismic Data Sharing in Southwest Pacific](#), 2–3 November 2015, Suva, Fiji recognized the contribution of the Oceania Regional Seismic NETwork (ORSNET) in the seismic data sharing efforts in the Pacific. The ORSNET annual meetings in 2015 and 2016 considered the need to improve technical capability in ORSNET countries and agree to extend the network to other seismic observatories such as French Polynesia under the data sharing policy. To date 38 seismic stations are being shared in the South West Pacific between New Caledonia, Vanuatu, Solomon Islands, Fiji, Samoa, and Tonga, over 20 stations are planned to come, three bilateral agreements have been signed between countries for mutual support. All stations data is shared with PTWC since 2017.

156 Ms Garaebiti shared the following recommendations of the Task Team on Seismic Data Sharing:

- Integrate the remaining countries as agreed by ORSNET members
- Strengthen Regional and international Seismological Observatories Partnerships for:
 - Increased training efforts, (basics in seismology, TWS process, Network Maintenance, Standardization Processes, Focal Mechanism, Intensity and

Shake maps, warning dissemination systems, risk mapping and planning, etc.

- Continue mutual exchange to support each other technically and financially, e.g. Vanuatu-Solomon Islands, Vanuatu-Tonga, Fiji-Tonga, etc.
- Increase technical capacities of National Seismological Observatories for complete Earthquake and Tsunami EWS from detection to the end to end warning dissemination system (e.g. CAP)
- Advocate for national and regional funding support mechanisms
- While there were efforts to seek continued funding from the French Pacific Funds, there was a need at the same time for the ORSNET programme to be regionally aligned and institutionalised for future sustainability.

157 The intrasessional Working Group discussed and presented recommendations about the following aspects:

- Data sharing in the South West Pacific
- Common Alerting Protocol (CAP)
- Member States expectations from TSPs for local-source tsunami
- New tsunami sensing platforms
- Minimum competency required for TWC operations
- Future of Working Group and associated Task Teams

158 Mr David Coetzee (New Zealand), Chair of the Working Group on Disaster Management, Preparedness & Reduction, started his report by remembering Julie Leonard (USA), vice chair of the WG, who sadly passed away during the inter-sessional period. He expressed that Julie's contribution to the WG and in the areas of Aid and Disaster Risk Reduction in especially Spanish speaking countries was well recognized and will be remembered. Mr Coetzee recalled that the PTWS Steering Committee appointed Dr Laura Kong (USA/Director of ITIC) to the role of vice chair in June 2016.

159 The report of WG3 was structured around the following parts:

Response:

- Completion of the Standard Operating Procedures Guideline.
- Completion of TEMPP Pilot in Honduras, including identifying tsunami evacuation zone mapping best practice

Preparedness:

- Introduction of the Tsunami Ready recognition programme
- Public education material developed by New Zealand
- Maritime Planning & Preparedness Guidelines for harbours and ports developed by the US National Tsunami Hazard Mitigation Programme
- Guidelines for hotels available at ITIC and NEAMTWS
- Tsunami Glossary completed by ITIC

Reduction:

- Structural engineering design tsunami provisions available from USA and soon New Zealand, and 2018 International Building Code

- Requirement for tsunami source data to support risk reduction

Training: on-going need for warning & response training in the South West Pacific, including introduction of competency based training. Funding is required to advance these.

160 TOWS Task Team on Disaster Management & Preparedness:

- Greater consistency required in Wave exercise evaluations across the ICGs
- Supervision over adaptations of UNESCO/IOC material to be performed by ITIC and IOTIC
- Interest and piloting of Tsunami Ready across ICGs
- Importance of using the Common Operating Protocol (CAP) in the end-to-end warning process
- World Tsunami Awareness Day in 2017 will focus on Global 'Target B' of the Sendai Framework; material available from the UNISDR; countries are also encouraged to share material with UNISDR

161 The intrasessional Working Group discussed and presented recommendations as follows:

- The Working Group noted the completion of the Tsunami Evacuation Mapping Plans & Procedures (TEMPP) pilot in Honduras, and discussed the way forward for the Task Team, noting the Task Team reports directly to the PTWS Steering Committee. The consensus was that the Task Team should continue with revised Terms of Reference as a separate capacity, reporting to the PTWS Steering Committee. This is to ensure an on-going experienced capacity is available to support countries that wish to conduct TEMPP.
- The Working Group noted the request of the PTWS Steering Committee that countries consider piloting the Caribbean Tsunami Ready guidelines. Countries in the South West Pacific indicated their intent to do this, however they have identified a need to contextualise the material with a view on the unique cultural and other country-specific characteristics, while applying the guidelines on a national scale will also need support. The meeting subsequently considered how to best provide the support required and agreed that the Terms of Reference of the TEMPP Task Team be broadened to include Tsunami Ready as a logical extension, and that the Task Team works with regional working groups and WG3 in facilitating the required support.
- It also noted that World World Tsunami Awareness Day (WTAD) is now an annual event under the auspices of UNISDR. Next WTAD will be on 5 November 2017. The meeting considered how to demonstrate support to WTAD. Some countries noted that they will observe WTAD through national exercises and drills at local/school level. It was also discussed that PacWave19 may be arranged such that it coincides with WTAD in 2019. The ITIC suggested that targeting schools through for example an evacuation drill may be an easier way to obtain media coverage. A recommendation was made that a Circular Letter be sent to Member States to encourage them to observe WTAD.
- It further noted that there is an on-going need for SOP training in the South West Pacific. Funding will be required to provide further training.

162 Dr Wilfried Strauch (Nicaragua) on behalf of the Regional Working Group on Tsunami Warning and Mitigation System on the Central American Pacific Coast (WG-CA) provided an overview of activities of the WG-CA. He indicated that in the reporting period important tsunami

related regional projects started and were executed in Central America, as the TEMPP project on tsunami risk mapping (2015–2017), a DIPECHO/UNESCO project on 2016–17 and the project on the development of CATAAC, 2016–2019. All significant for the development of the tsunami warning and mitigation system in the region.

163 He listed some tsunami related meetings in Central America including the Regional Geological Congress 2015 in Nicaragua, the Latin American Seismological Congress 2016 in Costa Rica, the 2016 Meeting on Tsunami Sources in Costa Rica, the 2016 Regional Workshop “Seismology and Tsunamis in CA” in Nicaragua. He recalled that in the very near future there will be the ICG/CARIBE EWS-XII session in Costa Rica (May 2017) and the Geological Congress of Central America, in San Salvador (June 2017).

164 Dr Strauch reported that the projects and meetings have led to multiple opportunities to discuss the development of the regional tsunami warning and mitigation system.

165 He mentioned the high level of tsunami related progress especially in El Salvador: Revision of national protocols and procedures for tsunami warning; Implementation of the CMT software supported by JICA/Japan; Capacitation of 12 local commissions of Civil Protection, schools and municipalities. National Earthquake and Tsunami simulation on October 10, 2016; National Workshop on Risks of Earthquakes and tsunamis, supported by JICA on November 1st, 2016.

166 Dr Strauch reported that data from many seismic stations in Nicaragua, Costa Rica, El Salvador and Guatemala are exchanged in real time using SeisComp3. There are some formal or administrative problems with Panama, which will be solved in the near future. Honduras has problems with the maintenance of its seismic network and needs support from the other countries.

167 He indicated that due to the fact that the Chair of the WG-CA, Ms Angelica Muñoz, left the [Instituto Nicaragüense de Estudios Territoriales](#) INETER at the beginning of 2016, and is no longer working on tsunami matters, the Group is without a Chair. He noted that it is envisioned that the WG-CA may elect a new Chair during the ICG/CARIBE EWS XII session in May, 2017.

168 Dr Wilfried Strauch (Nicaragua), also provided a report on the status of the Central America Tsunami Advisory Centre (CATAAC) under development at INETER in Managua, Nicaragua. He noted that while there was active communication and intense interaction among members the Task Team was not formally established and Chair and Vice Chair were not elected.

169 He noted that INETER/Nicaragua cooperated with institutions and scientists from all the Central American countries, from Japan (JMA, Univ. Hokkaido), Mexico (NTWC, CENAPRED, UNAM), Colombia (Geolog. Survey, NTWC), Ecuador (NTWC), SED/ETH Switzerland. It was made use of the frequent meetings on tsunami related topics in Central America. (Congresses & Workshops on Geology, Seismology, Tsunami in Central America) to discuss the requirements of tsunami services. Draft capability guidelines and performance indicators were developed. Dr Strauch reported that exchange of data is principally ensured using SeisComp3 systems in all CA countries with Panama and Honduras still to be acquired. He also reported that draft of SOP and contents of Tsunami Services were developed and resource requirements were identified. Funding was requested and obtained from Nicaraguan Government, JICA, and for some related topics from Swiss Cooperation.

170 Dr Strauch further reported that the Nicaragua-Japan project about the reinforcement of CATAAC aims to the capacitation of INETER personnel, development of the monitoring and early warning system, development of SOP, and capacitation of the NTWC and TWFPs in the

Central American countries which will receive the CATAC advisory. In this project INETER cooperates with the Japanese institutions JMA and Hokkaido University with support from JICA.

171 In response to a question from USA, Dr Strauch described the nature of the services envisioned by CATAC, which will focus on regional or local sources that are the most dangerous hazard for Central America given there is very short time for reacting. He noted that many localities of the countries in this region don't know what to do in case of tsunami therefore they want to concentrate on changing this. Language of products needs to be in Spanish and better bathymetry will be required to provide more accurate forecast products.

172 Captain Rafael Hurtado (Colombia) on behalf of the Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region ([SRATPS](#)), reported about the improvements done in the technical capacities to manage the tsunami risks. He highlighted the work in public education done by Peruvian entities, and the technical improvements done in Ecuador to increase the effectiveness of the tsunami alert bulletins and messages. Another remarkable improvement was the Development by [Hydrographic and Oceanographic Service of the Navy](#) (SHOA) of a new Tsunami Threat Forecast Software called SIPAT (Integrate Forecasting and Tsunami Warning System). And finally, the adoption of a new protocol for tsunami events as part of the Colombian national disaster management system. The Group recommended continuing with slightly modified Terms of Reference to consider the Sendai Framework for Action, Training and Capacity Development, reinforcement of regional communications and Tsunami Ready piloting.

173 Mr Ofa Fa'anunu (Tonga), Chair of the Regional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region reported on key activities through a [PowerPoint presentation](#).

174 The intrasessional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region discussed and presented recommendations as follows:

- To re-establish the Working Group
- To change the name with revised Terms of Reference of the Southwest Pacific Regional Working Group on Tsunami & Mitigation to "Pacific Island Countries and Territories Regional Working Group on Tsunami & Mitigation" to include Pacific Countries and Territories outside the Southwest Pacific
- That the ICG/PTWS recognizes the critical contribution of the Oceania Regional Seismic Network (ORSNET) to the PTWS and appreciate the French government's contribution that helped establish this key network. The ICG/PTWS to requests ORSNET Member Countries to urgently seek funding resources with relevant development partners to sustain this important network
- That the ICG/PTWS appreciates NOAA and ITIC development of the TsuCAT tool for hazard assessment, tsunami exercises, and event situational awareness and looks for their continued expertise and support to utilize the tool. The WG encourages countries to implement training events with development partners on how to utilize the tool to strengthen their tsunami preparedness and warning operations
- To establish a Task Team on Capacity Development under the WG and instruct WG2 to develop guidelines on minimum competencies of warning personnel as a matter of urgency for consideration at the next steering committee meeting

175 Mr Hing-yim Mok (China), Chair of the Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region, reported that the Group met twice in

the intersessional period, at the Sixth meeting of the Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (ICG/PTWS-WG-SCS/VI) that was held in Shanghai, China, 1-3 March 2017, and at the Fifth meeting of the WG-SCS held in Manila, Philippines, the 2-4 March 2016 (ICG/PTWS-SCS-WG/V). He reported progress on tsunami hazard assessment, mainly through the hosting of the [Scientific meeting of experts for coordinated scenario analysis of future tsunami events and hazard mitigation schemes for the South China Sea region](#), 16-18 November 2015, Xiamen, China. The meeting concluded that based on the review of sources, the Manila Trench poses the highest potential to generate great earthquakes that may spawn tsunami waves with widespread effect in the South China Sea region. He indicated progress on seismic and sea level monitoring capability through the definition of a list of seismic and sea level monitoring core stations in the South China Sea Region as a basis for further enhancing tsunami warning capability, and through the establishment of a South China Sea Seismic and Sea Level Data Server by the South China Sea Tsunami Advisory Centre (SCSTAC) to facilitate the data sharing and exchange among the Member States. Mr Mok also reported that the WG-SCS started the development of plan to produce/adapt public education materials identifying public education materials available at ITIC and IOITC, and public education materials developed by UNESCO Jakarta, and agreeing that a portal webpage, as part of the SCSTAC public website, will be developed for easy access to the identified public education materials.

176 Mr Mok also reported on the establishment of the South China Sea Tsunami Advisory Centre (SCSTAC) that will be discussed in detail under item 4.7

177 China congratulated Mr Mok and expressed its appreciation to Mr Mok for his leadership through the works of the Group. They reported that consultations with Vietnam and Malaysia may allow the group to propose a new Chair at this session.

178 The **ICG noted** the report of the Working Groups.

3.9. REPORT OF THE TASK TEAM ON FUTURE GOALS AND PERFORMANCE MONITORING

179 Chair Filomena Nelson reminded delegates that the Task Team on Future Goals and Performance Monitoring was established to develop goals and targets for the ICG/PTWS for the next two inter-sessional periods, develop a list of priority activities and resources requirements to help address the identified goals and develop metrics for monitoring the performance of the ICG/PTWS and provide an outline for the PTWS Status Report. She asked Mr Rick Bailey (Australia), Chair of the Task Team, to report on the status of the tasks commended to the Task Team.

180 Mr Bailey reminded the three pillars of the [Medium-term strategy: Pacific Tsunami Warning and Mitigation System \(PTWS MTS\), 2014-2021](#) (IOC/2013/TS/108) and the Seven Global Targets and Four Priorities for Action of the [Sendai Framework for Disaster Risk Reduction 2015–2030](#) (Sendai Framework), as guiding and reference sources for the Framework.

181 He suggested that a Framework for Goals & Performance Monitoring would enable:

- Document shared goals and desired outcomes
- Identify performance measures
- Demonstrate and manage progress
- Identify gaps
- Inform the work of the ICG

- Align with national & international priorities
- Secure resources

182 He recalled that the PTWS Implementation Plan has not been updated for some time, without major consequence. The proposal is then to replace the Implementation Plan with a PTWS Status Report presented to each session of the ICG/PTWS, compiled with input from all Working Groups including information from National Reports providing the required information using input from structured template. Performance will then be measured against ICG agreed performance indicators/targets.

183 Mr Bailey provided examples of targets and indicators for performance under each of the three PTWS MTS pillars and requested the participants to actively contribute to the definition of goals, indicators and priorities during the intra-sessional break out group meetings.

184 An intrasessional Working Group met and discussed this matter and reported under item 4.1.

3.10. REPORT OF THE TASK TEAM ON EVACUATION PLANNING AND MAPPING

185 The Chair recalled that the PTWS at its 26th session decided to have a balanced effort of the ICG/PTWS across: a) risk and hazard assessment; b) warning systems; and c) awareness and preparedness while re-orienting the ICG/PTWS to focus on the last mile of the end-to-end tsunami warning and mitigation system. Accordingly, the ICG/PTWS established the Task Team on Evacuation Planning and Mapping ([TEMPP](#)), to develop a new programme aimed at facilitating tsunami resilience through community preparedness, specifically through the preparation of tsunami evacuation maps and associated response plans for tsunami-vulnerable coastal communities. She invited Dr Laura Kong, ITIC's Director and Chair of the Task Team to report on the results of the Task Team work.

186 Dr Laura Kong (ITIC, USA), Chair of the PTWS Task Team on Evacuation Planning and Mapping Chair, presented the report of the Task Team, which was established by ICG/PTWS-XXVI to develop a new programme aimed at facilitating tsunami resilience through community preparedness. The Programme should focus on the preparation of tsunami evacuation maps and associated response plans using globally applicable, standardized tools and methodologies, and build from prior training efforts. Modules should cover Evacuation Planning, Map Development (inundation modelling and map creation), Tsunami Warning & Emergency Response SOPs, and Tsunami Exercises (including evacuation).

187 ITIC led the course development under its Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) Pilot, which taught the process of producing reliable and practical community-level tsunami evacuation maps. TEMPP, a collaborative effort of the USA (NOAA, USAID/OFDA), IOC, and New Zealand, was piloted in Honduras from July 2015 to February 2017. Central America countries and Mexico were also invited to participate. Dr Kong summarized the Pilot's activities, including the selection process, kick-off, five linked trainings, and between-training webinars, noting that a detailed summary was provided in her talk [Using the TEMPP process to build a Tsunami Ready community - Honduras pilot](#), given during the International Tsunami Workshop on 27 March 2017. The TEMPP Pilot required national agencies to work at the local level with communities to develop their tsunami evacuation maps, plans, and procedures. The Course covered cases where modelling was and was not available, and how to make inundation maps of worst case scenarios (TEMPP1 and 2), worked through the process of creating a community-owned evacuation map (TEMPP3), with routing, safe areas, signage, and evacuation plan (TEMPP4), and used an exercise to test emergency response operational readiness of the community (TEMPP5). Post-training evaluation provided feedback to improve each training.

188 The Course Development Team (CDT) identified best practices worldwide and advised on the training agendas. A partial list of practices is provided in the Task Team Report. The CDT was comprised of ITIC and preparedness practitioners from the Indian Ocean, who led implementations after the 2004 Indian Ocean tsunami, the Mediterranean ASTARTE Project that includes evacuation mapping and modelling research, New Zealand, Philippines, and USA (preparedness, tsunami modelling). The PTWS Task Team provided input through several meetings (3 February 2016, 28 June 2016, 22 February 2017), and by email.

189 The TEMPP process led to the completion of the [draft PTWS Tsunami Ready Guidelines](#), to pilot them in [Cedeño](#), Honduras. As part of TEMPP5, and in conjunction with [Exercise Pacific Wave 2017](#), the NTWC Comisión Permanente de Emergencias (COPECO) exercised its warning procedures on receiving the PTWC message for a Colombia-Ecuador scenario, and this was followed by a community exercise in which schools evacuated to safe areas according to their evacuation plan. After the exercise, a community exercise debrief and Tsunami Ready Review Board meeting were held. At the official Tsunami Ready ceremony on 16 February, IOC PTWS Technical Secretary Bernardo Aliaga presented UNESCO/IOC Tsunami Ready recognition certificates to Mr José Nahún Cáliz Alvarez, Marcovia Major, and Mr Dagoberto Majano, Local Emergency Committee (CODEL) Chair.

190 Dr Kong highlighted important lessons learned. By consensus, the most gratifying aspect was seeing the empowerment of and commitment from the local community and municipality through TEMPP and Tsunami Ready. She reminded the Group that community engagement was also the key action made by Samoa during her International Tsunami Symposium talk. A key for success is sustained country commitment, especially at the highest level since TEMPP should be applied for all tsunami-vulnerable communities. Linkage to multi-hazard preparedness can help in engaging and motivating communities to prepare—for example, Cedeño had never experienced a tsunami, but had suffered storm surge damage. Inclusion of all sectors and stakeholders was essential (local to national authorities, warning and emergency response officials, university scientists, NGOs), as they worked together to maintain the momentum required to meet the Tsunami Ready guidelines. Regional participation and data sharing was critical as it enabled tsunami modelling to be conducted for Cedeño. For the next TEMPP, two additional activities need to be included, which are for DEM grid construction, and Regional Tsunami Seismic Source identification.

191 The ITIC Director reported that the PTWS had successfully completed the Pilot at the February 2017 TOWS WG Inter-ICG Task Team on Disaster Management and Preparedness, and that is ready to provide guidance to countries wanting to implement similar projects. In 2017, the ITIC and PTWS will finalise the TEMPP Course materials and make them available, and in 2018, publish it as an IOC Manual. To date, the IOTWMS and CARIBE-EWS have indicated interest in the TEMPP training course.

192 New Zealand thanked Laura Kong for the immense effort and energy put to this work and Samoa and China indicated interest on TEMPP training for the South West Pacific and South China Sea respectively.

193 The **ICG noted** the report of the Task Team.

3.11. REPORT OF PACIFIC WAVE EXERCISE 2016 AND 2017

194 Mr Satoshi Harada (Japan) Co-Chair of the Task Team on PacWave Exercises reported on the results of the Exercise Pacific Wave 2016 ([PacWave16](#)). He recalled that PacWave16 took place on 1-5 February 2016 as a regional table top exercise involving the 16 countries that receive the NWPTAC products, with the aim of evaluating experimental NWPTAC Enhanced Products and identify necessary modifications. He indicated that Summary Report [Exercise Pacific Wave 2016. A Pacific wide Tsunami Warning and Enhanced](#)

[Products Exercise, 1-5 February 2016. Volume 2: Summary report. IOC Technical Series, 126](#) became available in February 2017 on the IOC Website. He summarized its main findings as follows:

- All respondents ranked the text message as the most useful product, followed by the coastal amplitude forecast map. Moderately useful products were the travel time map and the deep ocean energy forecast map.
- All respondents agreed that the format and content of NWPTAC enhanced products were clear and easy to understand.
- The majority of respondents indicated the National Tsunami Warning Centers (NTWCs) and National Disaster Management Offices (NDMOs) understand the content of the enhanced products.
- Overall, respondents indicated that the format and content of the new enhanced products was satisfactory. Some changes were suggested by two respondents and these will be assessed by NWPTAC.
- Overall, respondents indicated that stakeholder agencies now have a better understanding of their goals, responsibilities and roles in tsunami emergencies. A number of respondents indicated gaps have been identified.
- The majority of respondents will be ready for the transition to the new enhanced products in 2018. However, nearly half of respondents will need to develop new SOPs, inform and prepare key stakeholders and conduct training in order to be ready.
- All respondents felt that:
 - exercise planning and conduct went well
 - the website was useful
 - the evaluation form was easy to use, and
 - the manual provided an appropriate level of detail.
- There was, however, one comment that some manuals were too large and there was some difficulty downloading them.

195 Mr Harada provided some recommendations on behalf of the Task Team to address these issues, and concluded highlighting that almost all respondents indicated that the format and content of the new enhanced products was satisfactory.

196 Ms Jo Guard (New Zealand) Co-chair of the Task Team PacWave Exercises reported on the Exercise Pacific Wave 2017 ([PacWave17](#)), held on 15–17 February 2017. She recalled that PacWave 17 had several objectives, as follows:

- Test communications from the PTWS Tsunami Service Providers to Member States.
- Test whether the PTWS Tsunami Service Provider products are interpreted by Member States accurately and in a timely manner.
- Test national and regional communication.
- Test national and regional cooperation.
- Testing of proposed South China Sea Advisory Center (SCTAC) products with PacWave17. Evaluation in parallel with PacWave17 by the Task Team-SCTAC with support from ITIC.

197

She reported that 34 countries including 6 sub-national entities participated in the exercise and submitted evaluation forms. From the received answers the Task Team extracted the following summary:

- No major issues with receipt of the PTWC/NWPTAC messages.
- All respondents indicated that:
 - the NTWC/NDMO know their specific response roles in the event of a tsunami
 - they have engaged in response preparation/planning prior to the exercise
 - they have SOPs
- Most of the respondents indicated that:
 - they have undertaken activities to increase their capability and capacity to support national tsunami response
 - they have a tsunami mass coastal evacuation plan
 - they have a country tsunami emergency response plan for regional/local tsunami
 - they have community tsunami routes, evacuation signs and assembly points for evacuation areas
- Most of the respondents indicated that:
 - they used the PTWC and NWPTAC messaging to assess their country's tsunami threat
 - they routinely conduct regional/local tsunami exercises
 - they have tsunami related curriculum programmes in place for all levels of education
- What went well:
 - Exercise planning at all levels
 - Documentation was generally well received and easy to understand
 - Collaboration in exercise planning and conduct across agencies
 - Having a number of scenarios to choose from.
- What did not go so well:
 - Short notice to prepare for the exercise (availability of documentation in advance of the exercise)
 - February is a difficult month for many countries due to heightened risk of wildfire, cyclone or summer holidays which affects planning and participation
 - Some countries experienced technical difficulties with communication (training issues, power outage, slow internet, fax out of order)
 - Papua New Guinea noted incomplete information for their country.
 - What could be improved:
 - The availability of an online website to update focal point and national contacts.
 - Improvements to PTWC message readability (forecast points differ from event to event, and there appears to be no protocol for changes or version control).

- Some countries would benefit from improvements to technology, and further exercising.

198 Ms Guard indicated that the feedback from the South China Sea scenarios would be reported under Agenda 4.7 as the South China Sea Tsunami Advisory Center tested its products in conjunction with PacWave17.

199 Ms Guard provided some recommendations on behalf of the Task Team to address identified issues and improve the performance of PacWave exercises.

200 Tonga indicated it is planning to have its own national exercise towards end of 2017. It enquired if another country was intending to do an exercise before that and on the possibility of being invited to observe their exercise. France requested the source parameters used in the different scenarios and fault dimensions to be made available to Member States, for comparing the numerical simulation of tsunamis with their own numerical simulations.

201 The **ICG noted** the report of the Task Team.

3.12. STATUS OF PROGRESS IN OTHER ICGS

202 François Schindelé (France), past Chairman of the ICG/NEAMTWS presented the recent activities and statements of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS). The major recent work was dedicated to the accreditation of the four Candidate Tsunami Service Providers (CTSP): Centre d'alerte aux tsunamis [CENALT](#), France; Istituto Nazionale di Geofisica e Vulcanologia [INGV](#), Italy; National Observatory of Athens [NOA](#), Greece; Kandilli Observatory and Earthquake Research Institute [KOERI](#), Turkey). Two accreditation task teams have been established to review the documentation and information provided by the CTSPs. During the XIII session of the ICG/NEAMTWS in Bucarest on September 2016, the ICG accredited the four centers that become Tsunami Service Providers (TSP). A NEAMWave17 exercise will be organized with 4 different scenarios (North-Eastern Atlantic, Western Mediterranean, Central Mediterranean and Eastern Mediterranean., in three days, and messages disseminated by one of the TSP.

203 Mr Rick Bailey (Australia), former chair of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) reported they have the same three pillars than the PTWS Medium Term Strategy, an IOTWMS Steering Committee, a Task Team on IOWave 16, 2 technical WGs and one regional North West Indian Ocean Working Group. He recalled that IOTWMS has three TSPs: Australia, India and Indonesia. Each TSP covers the entire Indian Ocean and recognising national sovereignty TSPs don't issue warnings directly for other countries. TSPs issue inter-operable potential threat information for Tsunami Warning Focal Points (TWFPs) and National Tsunami Warning Centres (NTWCs), for NTWCs then issue national warnings. He noted that tsunami threat information is made available to NTWCs from TSPs via Registered User web sites. Mr Bailey provided detailed information about the methods used by the TSPs in its [Presentation](#). Also available in the [TSP Service Definition Document](#). He reported IOTWMS run Communication Tests every 6 months with 21 out of 24 Member States participating at the latest one.

204 With respect to the availability of TSPs earthquake bulletins in the IOC List Server Mr Bailey indicated an issue, related to the fact that IOTWMS TSPs monitor and report on earthquakes mag >8.0 in neighbouring oceans, which may generate tsunamis that may enter and threaten the Indian Ocean. When IOTWMS TSP bulletins on IOC List Server advised "No Threat" this caused confusion for other ocean regions reporting threats in their basins. This matter was addressed and solved by IOTWMS TSPs that have included wording agreed at TOWS-WG to highlight "No Threat" applies to Indian Ocean only.

205 Standard Operating Procedure (SOP) Training Workshops are held annually at one of the three TSPs. It involved representatives from NTWCs, DMOs, and sometimes media. IOWave Exercise 16 included community engagement for the first time. Mr Bailey reported increased focus on the last mile as from the last ICG, with funding from UN ESCAP for community awareness and preparedness provided through the Indian Ocean Tsunami Information Center (IOTIC).

206 Mr Bailey summarised the report on the status of the ICG/IOTWMS with the following elements:

- Success of greater focus on last mile, especially involving more communities in education and awareness activities, tested by highly successful exercises such as IOWave 16 including community evacuations and sharing of best practices
- The projects and benefits possible due to active Indian Ocean Tsunami Information Centre (IOTIC) and support of extra-budgetary funds in capacity building and coordination by IOC Secretariat
- Annual training on use of operational tsunami threat information provided by designated Tsunami Service Providers (TSPs) to National Tsunami Warning Centres (NTWCs), Disaster Management Offices (DMOs) and the media
- Ongoing requirements for technical enhancements in tsunami forecasting to facilitate effective community responses
- Benefits and progress towards performance monitoring for all elements, including links to Sendai Framework reporting

207 Capt. Rafael Hurtado Valdivieso (Colombia) presented the report of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS) on behalf of its Chair Ms Christa G. von Hillebrandt-Andrade. He recalled that ICG/CARIBE-EWS has 32 Member States and 16 territories. It extends from Bermuda to the North until Brazil in the South, covering all the Lesser and Greater Antilles as well as the Gulf, Caribbean and Atlantic Coasts of Mexico, Central America and South America; over 70% of its Member States and Territories are SIDS

208 He indicated that ICG/CARIBE-EWS is currently organized with a Board of Officers, four Working Groups (WGs) and 3 Task Teams (TTs) for the period 2016–2017. He further indicated that 98% of CARIBE-EWS nations and territories have designated Tsunami Warning Focal Points (TWFPs) and half of them have nominated National Tsunami Warning Centres (NTWCs).

209 He reported on the [Eleventh session of the ICG/CARIBE EWS](#) hosted in Cartagena, Colombia, April 5–7, 2016 ([ICG/CARIBE-EWS-XI/3](#)). He indicated that among other important decisions and recommendations it recommended a Tsunami Service Model for the region and agreed that the US PTWC (Hawaii) be referred to as the CARIBE-EWS Tsunami Service Provider. The PTWC began the issuance of the Enhanced Products as of March 1, 2016 and will begin covering the domestic service for Puerto Rico and Virgin Islands in 2017—becoming the sole CARIBE-EWS provider.

210 Capt. Hurtado reported that after a 10-year steady increase in seismic and sea level data contributions, the number of available seismic stations improved from 10 to over 100 stations since 2004, which allowed tsunami bulletins to be issued in 5 minutes instead of 12 minutes. Sea level stations increased as well from 5 to almost 80 stations and the tsunami detection time dropped from 3 hours to 5-30 minutes. He emphasized that regular operator's

workshops and bimonthly online meetings of all operators and members of the Working Groups are essential for sustainability.

211 Capt. Hurtado informed that the Exercise Caribe Wave is held annually. In 2016 it had over 330,000 participants registered. The Caribe Wave 17 exercise held on March 21, 2017 got a record of participation with over 700,000 participants.

212 Capt. Hurtado reported that currently there are 52 TsunamiReady® communities in the Caribbean and Adjacent regions recognized by the US NWS TsunamiReady® and as part the international Tsunami Ready recognition program, implemented on a pilot basis by IOC as from 2015 (Recommended by the ICG/CARIBE EWS-X). With funding from USAID/OFDA and in-country support St. Kitts and Nevis completed the international Tsunami Ready requirements and was recognized as Tsunami Ready during the [World Tsunami Awareness Day](#) on November 5, 2016. ICG/CARIBE-EWS looks forward to supporting other ICG's with implementation of Tsunami Ready as also envisioned by TOWS-WG.

213 He noted that in support of the ICG/CARIBE-EWS there is the US NWS [Caribbean Tsunami Warning Program](#) and the Caribbean Tsunami Information Center (CTIC), which was established in 2013 through an MOU between UNESCO and Government of Barbados. He reported that the reappointment of an Interim CTIC Director is expected to happen soon.

214 The **ICG noted** the report of progress in other ICGs

3.13. REPORTS FROM UN AND NON UN ORGANIZATIONS

215 On coordination of PTWS and WMO RA-V Tonga indicated that coordination between IOC and the [World Meteorological Organization](#) (WMO) has been through [Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology](#) (JCOMM) and through TOWS-WG, specifically for Tsunami. He indicated that through TOWS-WG it has been flagged to WMO to support Member States to get access to Tsunami Services through GTS. Tonga also noted that in the South West Pacific region Member States have coordinated back to back meetings on tsunami matters with regional Disaster Risk Reduction Platforms and WMO regional meetings. Mr Rajendra Prasad, IOC Secretariat, reported that working cooperation with the [Pacific Community](#) (SPC) is ongoing on coastal hazards and Disaster Risk Reduction matters.

216 Dr Jerome Aucan (France/New Caledonia), Science and Society Committee Chair, Joint Task Force (JTF), updated the group on the *JTF SMART (Science Monitoring And Reliable Telecommunications), Subsea Cable Initiative*. This Joint task force was established to investigate the use of submarine telecommunications cables for ocean and climate monitoring and disaster warning. He recalled that JTF is composed by three United Nations agencies—the International Telecommunication Union (ITU), the World Meteorological Organization (WMO), and the Intergovernmental Oceanographic Commission of UNESCO (UNESCO/IOC)—which in collaboration with the telecommunications industry, governments and the international scientific community have pursued a course to integrate scientific sensors into new, SMART SubSea Cable Systems.

217 The scientific and societal reasons for the project are compelling. Tsunamis have the potential to threaten many of the world's coastal communities within minutes or hours of a large seismic event. Reliable, robust tsunami-warning systems will save lives and property. A relatively straightforward complement of instrumentation—accelerometers, high-resolution pressure gauges, thermometers—will answer many of the basic science and societal needs as well as provide for the monitoring of the physical state-of-health of the cable system itself. Technological advances have made it possible to integrate basic sensors with repeaters on submarine telecommunication cables at intervals of about 50-70 km. The JTF strongly

endorses the SMART cable concept and welcomes participation to ensure that humanity benefits from its realization. The science and societal case for the benefits of SMART cables is posted at ITU: www.itu.int/en/ITU-T/climatechange/task-force-sc/

218 New Zealand indicated that commercial cable services providers are key stakeholder because if they believe their operations would be affected by using their cables for science/operations, there would be very difficult to put this in place. Dr Aucan indicated that the [5th Workshop on SMART Cable Systems](#): Latest Developments and Designing the Wet Demonstrator Project, Dubai, United Arab Emirates, 17-18 April 2016 was an opportunity to approach operators of submarine cable systems. New Zealand asked what PTWS can do to support this initiative. Dr Aucan indicated that Member States could provide indications of interest which may help to convince commercial cable operators.

219 The **ICG noted** the report of UN and non UN organizations.

4. POLICY MATTERS

4.1. FUTURE GOALS AND PERFORMANCE MONITORING – PTWS STATUS REPORT

220 Chair Group reviewed the draft Framework and recommended:

- To confirm the Outcomes
- That some Key Performance Indicators (KPIs) and Targets be modified to be ICG/PTWS specific
- To continue the Task Team with revised Terms of Reference to further liaise with other ICGs to finalise it using 2017 National Reports and ICG/PTWS-XXVII outcomes as a baseline for performance and to develop a Status Report outline for PTWS
- To utilise the new National Report Template to gather status and performance information to populate Status Report and monitor ICG/PTWS performance

221 The **ICG agreed** to continue the Task Team on Future Goals and Performance Monitoring with modified Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. and **approved** Recommendation ICG/PTWS-XXVII.1

4.2. EVACUATION PLANNING AND MAPPING

222 Chair Ms Filomena Nelson recalled that the ICG/PTWS at its 26th session established a Task Team on Evacuation Planning and Mapping, to develop a new programme aimed at facilitating tsunami resilience through community preparedness, specifically through the preparation of tsunami evacuation maps and associated response plans for tsunami-vulnerable coastal communities. She requested Dr Laura Kong, ITIC's Director and Chair of the Task Team to introduce this agenda item.

223 Dr Kong summarised the recommendations proposed by the Task Team as follows:

- To note with appreciation the progress that has been made with regards to the establishment of a training programme for the creation of Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) under the lead of ITIC;
- To also note continuing challenges by countries in obtaining adequate bathymetric and elevation data sets for inundation and evacuation mapping, but that basic maps can be established that should not require detailed inundation modelling;

- To emphasize the importance that every tsunami-vulnerable community should have an evacuation map and plans, and should regularly practice through drills and exercises; and
- To note the interest of some Member States in the TEMPP process, and that the topic and interest was further discussed at the PTWS South West Pacific Working Group on August 22-23, 2016;
- To encourage Member States to make this a highest priority action to save lives.

224 Samoa asked if funding is available or possible for supporting countries in developing TEMPP processes. Dr Kong indicated there is no immediate available funding for this.

225 The **ICG agreed** to establish a Task Team on Tsunami Evacuation Maps, Plans, and Procedures, and Tsunami Ready, with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. and **approved** Recommendation ICG/PTWS-XXVII.1

4.3. PACIFIC WAVE EXERCISE 2019

226 The Chair Ms Nelson recalled that the Exercise Pacific Wave 17 (PacWave 17) is the seventh Pacific-wide drill in a regular schedule of one-every two-years Pacific exercises. She invited Ms Jo Guard (New Zealand), Co-Chair of the Task Team on PacWave Exercises to present its report.

227 Ms Jo Guard (New Zealand) on behalf of the Task Team on Pac Wave Exercises provided the recommendations of the Task Team for an Exercise Pacific Wave 2019, as follows:

- several Member States indicated in their responses to the survey on PacWave16 & 17 that for future PacWave exercises countries should consider conducting real time exercises simulating the presence of minimal staff during night time or weekend hours.
- Exercises to be conducted as joint exercises involving neighbouring countries organized through the PTWS Regional Working Groups.
- Conduct the exercise down to the community level, including where possible an extensive public awareness campaign.
- Exercise PacWave19 to be conducted in November to coincide with World Tsunami Awareness Day (5 November) also providing a public education opportunity. With an option of organising it in 2018 to allow reporting it at the next ICG/PTWS session.

228 Australia, China, France, New Zealand, USA and Vanuatu intervened on this agenda item. Several supported the idea of aligning PacWave with the World Tsunami Awareness Day (WTAD). France supported the idea of using several scenarios including past events, to support finding gaps on past events records. Considering typhoon regional seasons, some suggested a flexible approach to the exact dates of the exercise.

229 The sessional Working Group on PacWave 19 reported to the plenary the following suggestions:

- To move the next PacWave to the months of September through to November 2018 to support International Disaster Risk Reduction Day (13 October) and World Tsunami Awareness Day (5 November)
- To note the reason for the move from 2019 to 2018 is to provide appropriate time to compile the PacWave report in time for the next ICG meeting.

- To note that the reason for providing a three-month window to conduct the exercise is to allow Member States to select an appropriate time to conduct the exercise.
- PacWave18 will use past real events where possible (e.g. 2009 (Samoa), 2010 (Chile) and 2011 (Japan)) with the addition of other events if required.

230 Countries are encouraged to:

- Conduct the exercise in real time where possible
- Consider joint exercises involving neighbouring countries organized through PTWS Regional Working Groups
- Consider conducting the exercise down to community level

231 PTWC, NWPTAC and SCSTAC Communications tests will be held on 5 November (World Tsunami Awareness Day).

232 The **ICG agreed** to organise an Exercise Pacific Wave 2018 (PacWave18) which will take place in the months of September through to November 2018 to support International Disaster Risk Reduction Day (13 October) and World Tsunami Awareness Day (5 November). The ICG **also agreed** that PacWave18 will be conducted as a Pacific-wide exercise involving all PTWS countries as part of the regular biennial Pacific Wave exercise conducted since 2006.

233 The **ICG further agreed** to establish a Task Team on PacWave18 Exercise with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. and **approved** Recommendation ICG/PTWS-XXVII.1

4.4. TSUNAMI READY RECOGNITION

234 Ms Philomena Nelson, Chair of the ICG/PTWS, recalled that the PTWS Steering Committee noted at its meeting on June 2016 that the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS) has completed guidelines for a “Tsunami Ready” recognition programme, and that the material is available to PTWS. It acknowledged the potential of such programmes for the PTWS.

235 The ITIC Director Dr. Laura Kong presented an overview of the international Tsunami Ready program that was adapted from the 2015-approved ICG/CARIBE-EWS Tsunami Ready Guidelines. She provided background on the US TsunamiReady® program on which the Caribbean Tsunami Ready Guidelines were based, and described each international guideline using examples from Puerto Rico.

236 In June 2016, the PTWS Steering Committee (SC) noted that the ICG/CARIBE-EWS had completed guidelines for a Tsunami Ready recognition programme, and requested the PTWS Working Group 3 on Disaster Management, Preparedness, and Risk Reduction to investigate the extent to which the Caribbean guidance required adaptation for the PTWS, taking into account “Tsunami Ready” pilots.

237 For the TEMPP Pilot in Honduras, the Caribbean Tsunami Ready guidelines were adapted for pilot use in the PTWS, and used to conduct a PTWS Tsunami Ready pilot in Honduras. The [Draft PTWS Tsunami Ready Guidelines](#) are available in English, French, and Spanish, and additional information on the [Application Process](#) and Frequently Asked Questions ([FAQs](#)) are available in English.

238 Dr Kong reported that the TOWS-WG recommended the Assembly to instruct ICGs to consider piloting the CARIBE EWS Tsunami Ready guidelines and report back to the TOWS WG-XI (2018) with a view to develop harmonized consistent global guidelines

239 To date, Tsunami Ready recognition has been achieved in St Kitts & Nevis in the Caribbean and Cedeño (Honduras) in the Pacific. Currently, pilots are underway in Haiti and Grenada in the Caribbean, and Costa Rica in the Pacific. Chile, Ecuador and Mexico and Samoa, Tonga and Vanuatu in the South West Pacific, have indicated interest.

240 Australia, Samoa, Solomon Islands, USA and UN ISDR intervened under this agenda item. Australia recalled that this matter was discussed at TOWS-WG and the main concern was if this would trigger a full recognition programme that may require substantial resources. Several indicated the need to connect this initiative with UNDP and with UN ISDR. Mr Aliaga, IOC Secretariat indicated UNDP has been involved in Dominican Republic, Haiti and St Kitts & Nevis/Grenada.

241 The **ICG agreed** to establish a Task Team on Tsunami Evacuation Maps, Plans, and Procedures, and Tsunami Ready, with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1 and **approved** Recommendation ICG/PTWS-XXVII.1

4.5. ENHANCING PTWS TSUNAMI WARNING PRODUCTS

242 Chair Filomena Nelson introduced this agenda item by recalling that through Recommendation [ICG/PTWS-XXIII.1](#) a Task Team on Enhancing Tsunami Warning Products was established, with Chair Dr Charles McCreery (USA, PTWC Director), and later renamed to as Task Team on Enhanced Products.

243 Ms Nelson indicated that in the pursuit of improving PTWS tsunami warning products, Japan announced at the IOC Executive Council in July 2014, that the [Northwest Pacific Tsunami Advisory Centre](#) (NWPTAC) would also be preparing new products based on the requirements of the recipient countries. Following this announcement, during the 4th Meeting of the PTWS Steering Committee (PTWS SC) in July 2014, a proposed timeline for the NWPTAC to develop and introduce Enhanced NWPTAC Products was agreed, targeting 2018 for its complete transition. She further recalled that [PacWave 17](#) was designed to test among others the new NWPTAC Enhanced Products.

244 Ms Nelson indicated that a [Draft Recommendation](#) has been made available in advance by the Task Team for this subject as posted to the meeting website.

245 Dr Charles McCreery (USA), Director PTWC, recalled the status of current PTWS products and reported some coming substantive changes that will be soon implemented, including rearrange order countries are named in threats according to their ETAs (soonest to later) and include “Tsunami not confirmed yet” or “Tsunami confirmed”.

246 Dr McCreery also reported on adjustments that affect single countries (polygons/forecast points) and indicated an emergency change on RIFT to include Austral Islands of French Polynesia. He reminded the Process for Product Changes as agreed by the ICG/PTWS XXVI session and the PTWS Steering Committee.

247 Mr Satoshi Harada (Japan) on behalf of Mr Tomoaki Ozaki (Japan), Vice-Chair of the Task Team on Enhanced Products, presented the report of the Task Team including detailed information about NWPTAC Enhanced Products for PTWS. The report is attached in full under ANNEX IV.

248 ITIC acknowledged that JMA has done a very careful job following all the steps and consulting with Member States as well as incorporating feedback obtained through the PacWave exercises. She welcomed the provision of training materials from JMA when its enhanced products are finalized.

249 The **ICG endorsed** the Northwest Pacific Tsunami Advisory Center's plan to begin issuing in experimental mode its new NWPTAC Enhanced products in 2017.

250 The **ICG approved** Recommendation ICG/PTWS-XXVII.2

4.6. TRAINING

251 The Chair invited Dr Laura Kong, Director ITIC, to introduce this item. She indicated that the subject is broader than the activities of training of ITIC. She recalled that the IOC has the Ocean Teacher Global Academy that has been offered to service the requirements of PTWS to take advantage of remote training facilities and decentralised training centres.

252 Tonga indicated that within the framework of the Working Group for the South West Pacific Region, which has conducted consultations on this matter, the requirement is to have training guidelines for staff competencies. Samoa reported that in discussions with USA it became clear to South West Pacific participants that training opportunities on tsunami matters are available separately from opportunities of training in the field of Meteorology.

253 USA reported that there are two levels of training, regular training with NOAA/NWS/ITIC and residence training that is a different kind of service that is difficult to organize and require resources.

254 New Zealand indicated that this kind of training is more structured and involve standards related to the operation of a Tsunami Warning Center, for example a training system that is structured by levels for operators of systems (EWS), like Australia has developed. Australia indicated that that the training of operational units is provided to its staff and requires considerable resources.

255 The **ICG instructed** Working Group 2 on Tsunami Detection, Warning and Dissemination, to establish by mid-2018, the minimum competency level for NTWC operations, by identifying a) what competencies are required and b) what training schemes are currently in existence and what guidelines and principles can be adapted for this purpose.

4.7. SOUTH CHINA SEA TSUNAMI ADVISORY CENTER

256 Chair Ms Nelson recalled that at its 26th session the ICG PTWS established a Task Team, within the South China Sea Sub-Regional WG Task Team, on Establishment of a South China Sea Tsunami Advisory Center (SCSTAC). She further recalled that this Task Team has reported to the WG on the South China Sea region, which has oversight its development. Ms Nelson indicated that a Draft Recommendation has been made available in advance by the Task Team for this subject as posted to the meeting website. She invited Dr Ye Yuan (China), Chair of the Task Team, to report under this agenda item.

257 Dr Ye Yuan (China) provided the background of SCSTAC. He recalled that the ICG/PTWS 24th Session, Beijing, 2011, received a proposal on the Establishment of South China Sea Tsunami Warning and Mitigation System and the ICG/PTWS 25th Session, Vladivostok, 2013 decided to establish a Task Team on the Establishment of a South China Sea Tsunami Advisory Centre (TT-SCSTAC) and accepted the offer of the National Marine Environmental Forecasting Center of China to host the SCSTAC.

258 He recalled the purpose of the Task Team, which is to assist the WG-SCS in the establishment of the SCSTAC until it has the ability to provide operational services. He also noted that the membership of the Task Team is composed by representatives of Brunei Darussalam, China, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam, as well as representatives of PTWC and NWPTAC.

259 Dr Yuan reported that the Task Team was able to complete a Survey Report on Regional/National Tsunami Warning Criteria and Products and the Establishment of the SCSTAC Requirements & Implementation Plan. He indicated that the full process and detailed description of the operations and products of the proposed SCSTAC is available in the document [Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System](#). He also provided detailed information on the operational and organizational requirements and its status of achievement. He also reported on the [outcomes of the post-exercise evaluation of the SCS Tsunami Exercise](#) that was held in conjunction with PacWave17 to test the proposed SCSTAC products.

260 USA inquired about the forecasting boundaries of SCSTAC. Dr Yuan responded that areas outside of the South China Sea region are related to scenarios location, including North West Pacific and South West Pacific sources that could affect the South China Sea.

261 ITIC inquired about the recommendation of integrating the SCSTAC Director to the Inter-ICG Task Team on Tsunami Watch Operations. Australia and the Secretariat reminded that it is the Chair of the ICG who nominates members to the Inter-ICG Task Teams for a period of two years.

262 Noting that the tsunamis are not very frequent in the South China Sea region Dr Yuan commented that a multi-hazard approach would make the whole system more sustainable, considering that tsunami observing systems can be used to monitor many other hazards. He suggested that TOWS-WG may consider to explore it further in the future, to improve the sustainability of the system.

263 The **ICG decided** to commence the trial operation of SCSTAC in late 2017, with a specific date to be decided by the PTWS Steering Committee and **approved** [Recommendation ICG/PTWS-XXVII.1](#)

4.8. PTWS GOVERNANCE AND STRUCTURE

264 Chair Filomena Nelson introduced this agenda item that was suggested by the PTWS Steering Committee to obtain Member States' views about the best way of organising the inter-sessional work, currently through Working Groups and Task Teams.

265 Chair Nelson presented the [PTWS Governance Structure](#) emerging from this meeting.

266 Japan, seconded by Australia, expressed that some of the work performed by the delegates at the present session of the ICG/PTWS has been excellent. However, there is benefit for beginning the efforts of the Working Groups sooner and creating documents and papers in advance. Perhaps setting a goal for four months before the event to have more reliable input of to the process and help to improve our coordination prior to these face to face meetings.

267 The **ICG encouraged** all participants to the ICG/PTWS to develop and post documents for the next Session as early as possible, preferably at least one month prior to the beginning of the Session, for improved preparation for the Session. Member states should make their presentation to plenary as brief as possible and to the point, to leave enough time for discussion among all participants to the Session;

4.9. FINANCES AND RESOURCES

268 The Chair recalled Recommendation ICG/PTWS-XXIV.1 that requested the Steering Committee to Develop a Strategy for funding PTWS activities. She asked views and suggestions from Member States about priorities for the next biennium, based on the initial list of priorities provided by the Task Team on Future Goals and Performance Monitoring during the intra-sessional meeting.

269 The **ICG endorsed** the list of priorities for funding as included under Appendix 2 to [Recommendation ICG/PTWS-XXVII.1](#)

5. PROGRAMME AND BUDGET FOR 2018–2019

270 This agenda item was only informational. On behalf of the Secretariat, Mr Bernardo Aliaga, Technical Secretary of the ICG/PTWS, reported on the resources assigned from the UNESCO regular budget to the work of the Tsunami Unit of the IOC. He indicated that for the biennium 2018–2019 a slight increase in the regular budget may also impact positively in the resources available for the ICG/PTWS. Mr Aliaga thanked Member States support through extra-budgetary and in kind contributions. In response to questions about UNESCO and IOC membership he explained that IOC focal points are different from ICG/PTWS focal points and from UNESCO focal points. Mr Prasad reminded South West Pacific Member States to nominate IOC focal points according to the [IOC Circular Letter No 2634](#).

6. NEXT SESSION

6.1. CONFIRMATION OF DATE AND PLACE OF ICG/PTWS-XXVIII

271 The Chair invited interventions from Member States on the subject.

272 Nicaragua offered to host the 28th session of the ICG/PTWS in in late March or early April 2019.

273 Australia, USA and ITIC suggested the dates of the next session of the ICG/PTWS are coordinated with the dates of the sessions of the ICG/CARIBE-EWS and ICG/IOTWMS.

274 Australia, commended France/French Polynesia for the hosting of the International Workshop as an excellent opportunity to discuss and provide updates about scientific knowledge and research advances at national level, given the limited time available under the ICG for these discussions. Australia, Chile China, France, Japan, New Zealand, Tonga and ITIC volunteered to integrate the organizing committee of the next International Workshop.

275 The **ICG accepted** the offer of Nicaragua to host the 28th session of the ICG/PTWS in March or April 2019, over 4 days, with a one-day international scientific workshop immediately before the session.

6.2. TARGET DATE FOR ICG/PTWS-XXIX

276 The **ICG decided** to schedule its 29th session in March/April 2021.

7. ELECTIONS OF OFFICERS

277 The Chair handed over this part of the Meeting to the Chair of the Elections Commission, Mr David Coetzee (New Zealand).

278 Mr Coetzee recalled that the Election of Officers of the ICG/PTWS was announced with the Invitation in [Circular Letter 2648](#), providing the required forms. Open for nominations were

the positions of one Chair and two Vice-chairs (note CL 2648 called for nominations for three Vice-chairs; this was incorrect and confirmed as two positions during the opening of ICG/PTWS-XXVII, in accordance with a decision at ICG/PTWS-XVI). The deadline for nominations was set in CL 2648 and confirmed in the Annotated Agenda as Wednesday, 29 March 2017, at 17:00 Local Time Tahiti.

279 Nominations were received by the Secretariat before the deadline for all open Officers positions. Each nomination was duly dated, timed and signed by the Secretariat.

280 The Elections Committee, composed of the USA, France, and New Zealand, chaired by Mr David Coetzee, New Zealand, met on Friday, 31 March at 08:00. It duly scrutinized the nomination papers. One nomination was received for the position of chair and two nominations were received for the vice-chair positions. The nominations were considered complete, correct and in the required form and format.

281 The Elections Committee reported that there was only one nominee for each position and therefore there was no need for voting to take place.

282 The **ICG accepted** the proposal of the Elections Commission and **elected** the Officers by acclamation as follows:

- Chair: Ms Filomena Nelson (Samoa)
- Vice-Chair: Mr Satoshi Harada (Japan)
- Vice-Chair: Mr Wilfried Strauch (Nicaragua)

8. ANY OTHER BUSINESS

283 Under this agenda item USA announced a trial for resumption of [RANET SMS AlertWatcher Service for PTWS](#).

284 The Head of the US Delegation recalled that in 2005, after the 2004 Indian Ocean tsunami, at the request of ITIC and based on requests for assistance from Indian Ocean countries and Pacific Small Island Developing States (SIDS) to help notify key officials of Pacific Tsunami Warning Center (PTWC) tsunami alerts, an SMS/Mobile Phone Text Messaging system was developed. The RANET Project (Radio and Internet for the Communication of Hydro-Meteorological and Climate Related Information) implemented the service, funded by both National Oceanic and Atmospheric Administration (NOAA), and the US Agency for International Development Office of US Foreign Disaster Assistance (USAID/OFDA).

285 In October 2014, the original RANET SMS Service was discontinued with the start of PTWC's issuance of its enhanced products. PTWC stopped issuing Tsunami Watch and Warning messages to its international Area of Responsibility (AOR) necessitating a stop to the SMS Service until a new SMS product could be formulated.

286 Pacific Island countries continue to make requests to NOAA for an SMS service to provide a heads-up about a potential tsunami threat. In response, the NOAA/NWS and UCAR/COMET@IEPAS have redeveloped the RANET SMS AlertWatcher system to make it more robust, and easier to monitor and use by the PTWC and ITIC, in cooperation with the UNESCO IOC ICG/PTWS.

287 During the intersessional period, 2017–2019, NOAA will trial a heads-up SMS alert service for UNESCO/IOC ICG/PTWS Member States in response to requests—especially from SIDS and Americas partners. This trial SMS notification will be sent to only three vetted officials in each country. This service is not meant to replace official warning systems, but rather to act

as a heads-up to officials, wherever they may be at the time, after which they can seek out full information from established and official communication sources.

288 Therefore, and on the endorsement of the ICG/PTWS-XXVII, NOAA will conduct a two-year trial for the resumption of the RANET SMS AlertWatcher, with the following Terms of Reference:

Trial Service Description

- PTWC Heads-up SMS
 - 1 SMS if only a PTWC Information Statement is required,
 - 3 SMS messages if there is a potential threat, consisting on the initial PTWS threat, issuance of the threat forecast, and the final threat message.
- Service cannot guarantee 24x7 service and timelines, as the past has shown that the prior service was prone to subscriber or carrier interruptions.

Trial Service Customers: PTWS Member State authorized officials

Trial Service Sign-up

- Announcement through IOC Circular Letter
- Upon receiving the IOC Circular Letter, interested Member States should indicate their interest in subscribing to the UNESCO IOC PTWS Technical Secretary, along with current mobile phone numbers of up to 3 persons.
- Subscriptions will be vetted through UNESCO IOC, and sent to NOAA/NWS/PTWC.
- Member States shall be responsible for keeping the mobile phone numbers current, and for notifying the UNESCO/IOC PTWS Technical Secretary when an update is required.

289 Samoa and the Chair of the ICG/PTWS, Ms Filomena Nelson, supported the proposal and thanked the USA for responding to the request of Pacific SIDS.

9. ADOPTION OF DECISIONS AND RECOMMENDATIONS

290 The **ICG** debated in Plenary and **approved** three recommendations as included under ANNEX II.

10. CLOSURE

291 The session was closed at 5:10 pm on 31 March 2017.

ANNEX I

PROVISIONAL AGENDA

- 1. WELCOME AND OPENING OF SESSION**
- 2. ORGANIZATION OF THE SESSION**
 - 2.1 ADOPTION OF AGENDA
 - 2.2 DESIGNATION OF THE RAPPORTEUR
 - 2.3 CONDUCT OF THE SESSION, TIMETABLE AND DOCUMENTATION
- 3. REPORT ON INTERSESSIONAL ACTIVITIES**
 - 3.1 CHAIRPERSON'S REPORT
 - 3.2 SECRETARIAT REPORT
 - 3.3 REPORT FROM SCIENCE AND DISASTER MANAGEMENT WORKSHOPS
 - 3.4 TOWS-WG REPORT
 - 3.5 WARNING & ADVISORY SERVICES REPORT
 - 3.5.1 PTWC
 - 3.5.2 NWPTAC
 - 3.6 ITIC'S REPORT
 - 3.7 NATIONAL PROGRESS REPORTS
 - 3.8 WORKING GROUP REPORTS
 - 3.9. REPORT OF THE TASK TEAM ON FUTURE GOALS AND PERFORMANCE MONITORING
 - 3.10. REPORT OF THE TASK TEAM ON EVACUATION PLANNING AND MAPPING
 - 3.11. REPORT OF PACIFIC WAVE EXERCISE 2016 AND 2017
 - 3.12. STATUS OF PROGRESS IN OTHER ICGs
 - 3.13. REPORTS FROM UN AND NON UN ORGANISATIONS
- 4. POLICY MATTERS**
 - 4.1. FUTURE GOALS AND PERFORMANCE MONITORING – PTWS STATUS REPORT
 - 4.2. EVACUATION PLANNING AND MAPPING
 - 4.3. PACIFIC WAVE EXERCISE 2019

- 4.4. TSUNAMI READY RECOGNITION
- 4.5. ENHANCING PTWS TSUNAMI WARNING PRODUCTS
- 4.6. TRAINING
- 4.7. SOUTH CHINA SEA TSUNAMI ADVISORY CENTER
- 4.8. PTWS GOVERNANCE AND STRUCTURE
- 4.9. FINANCES AND RESOURCES
- 5. PROGRAMME AND BUDGET FOR 2018–2019**
- 6. NEXT SESSION**
 - 6.1 CONFIRMATION OF DATE AND PLACE OF ICG/PTWS-XXVIII
 - 6.2 TARGET DATE FOR ICG/PTWS-XXIX
- 7. ELECTIONS OF OFFICERS**
- 8. ANY OTHER BUSINESS**
- 9. ADOPTION OF DECISIONS AND RECOMMENDATIONS TO THE IOC GOVERNING BODIES**
- 10. CLOSURE**

ANNEX II

ADOPTED RECOMMENDATIONS

Recommendation ICG/PTWS-XXVII.1

ICG/PTWS Governance

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recalling IOC Resolution IV–6 that established the International Coordination Group for the Tsunami Warning System in the Pacific (ICG/ITSU) and IOC Resolution XXXIX-8 that renamed ITSU to be the Pacific Tsunami Warning and Mitigation System (PTWS) and to provide continuity through the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Reaffirming that the Pacific Tsunami Warning and Mitigation System (PTWS) is a coordinated network of national systems and capacities, and is part of a global network of early-warning systems for all ocean-related hazards,

Noting:

- Recommendation ICG/PTWS-XXVI.3: The ICG decided to constitute, under the Steering Committee, a Task Team to look into performance monitoring measures for Tsunami Service Providers (TSPs), National Tsunami Warning Centres (NTWCs), and national warning systems starting from the PTWS Medium-term Strategy 2014–2021 (IOC/2013/TS/108) established goals,
- The Tenth Meeting of the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG-X), that **recommended** the Assembly to instruct the ICG/PTWS, in line with the IOC XXVII Assembly decision 8.2, to continue its work on the Key Performance Indicators to cover all aspects of the Tsunami Warning and Mitigation Systems, aligning as closely as possible with the Sendai Framework, and share it to the other ICGs for consideration by the Member States, and report back to TOWS XI with a view to establish global KPIs,
- 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),
- IOC Executive Council Decision EC-XLIX/4.2 on IOC Contribution to the Sendai Framework for Disaster Risk Reduction 2015–2030,

Reaffirming further that each Member State has the sovereign responsibility to issue warnings within its respective territories,

Recalling the Mauritius Declaration adopted at the Intergovernmental Coordination Meeting held at Grand Baie, 14–16 April 2005 to openly share and exchange tsunami-relevant real-time observational data in accordance with the UNESCO/IOC Oceanographic Data Exchange Policy,

Noting with appreciation the tsunami forecasting products provided for the Member States of the PTWS by the PTWC hosted by the USA and the NWPTAC hosted by Japan, and training and mitigation materials by the ITIC,

Noting with appreciation NOAA and ITIC development of the Tsunami Coastal Assessment Tool (TsuCAT) tool for hazard assessment, tsunami exercises, and event situational awareness, and looking for their continued expertise and support to utilize the tool.

Recalling Decision IOC-XXVIII/8.2 which decided to continue the TOWS-WG for the next intersessional period with the existing terms of reference and membership, and accepted the report of TOWS-WG and its recommendation of continuing the Inter-ICG Task Teams on Disaster Management and Preparedness, and Tsunami Watch Operations for the next intersessional period, with the same membership and a slight change in Terms of Reference,

Having reviewed the progress made in the implementation of the PTWS since the 26th Session of the ICG/PTWS,

Having considered the reports of:

- Working Group 1 on Tsunami Hazard Assessment
- Working Group 2 on Tsunami Detection, Warning and Dissemination
- Working Group 3 on Disaster Management, Preparedness and Risk reduction
- Task Team on PacWave Exercises, on PacWave16, and on PacWave17
- WG2 Task Team on Enhancing Products
- WG2 Task Team on Seismic Data Sharing in the South West Pacific
- Task Team on Evacuation Planning and Mapping
- Task Team on Future Goals and Performance Monitoring
- Regional Working Group on Tsunami Warning and Mitigation System in the Central American Pacific Coast
- Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region
- Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region
- Task Team of the Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region on Establishment of a South China Sea Tsunami Advisory Center
- Task Team of the Regional Working Group on Tsunami Warning and Mitigation System in the Central American Pacific Coast on Establishment of a Central America Tsunami Advisory Center
- 6th Meeting of the PTWS Steering Committee (via teleconference), 31 August 2015
- 7th Meeting of the PTWS Steering Committee, Honolulu, Hawaii, USA, 29 June - 1 July 2016
- 9th and 10th Meetings of the TOWS-WG and its Task Teams, Paris, France, March 2016 and March 2017
- North West Pacific Tsunami Advisory Center (NWPTAC)
- Pacific Tsunami Warning Center (PTWC)
- International Tsunami Information Center (ITIC)
- Chair's Report
- Reports of the ICG/IOTWS, ICG/NEAMTWS, ICG/CARIBE-EWS,
- Report on coordination between PTWS and WMO RA-V

- Report on the Joint Task Force to Investigate the use of Submarine Telecommunication Cable for Ocean and Climate Monitoring and Disaster Warning (ITU, WMO, and IOC)

Recognizing the importance of inclusion of emergency managers to help re-orient the ICG/PTWS to focus on community preparedness of the end-to-end tsunami warning and mitigation system,

Encourages Member States to include representation of Disaster Management Organizations (DMOs) and/or relevant social scientists in their delegations to the ICG and relevant inter-sessional Working Groups;

Acknowledging that the PTWS is effective in saving lives and reducing the impacts to communities in both near-field and distant-tsunami events through the three pillars of risk assessment and reduction, detection, warning and dissemination, and awareness and response;

Noting that Working Group 3 has expressed a need for tsunami hazard assessment to support planning and risk reduction, and that the need for hazard assessment should therefore be informed by Working Group 3, the Terms of Reference of PTWS Working Group 1 (Understanding Tsunami Risk) reflects emergency management needs more directly;

Noting the expertise that the Task Team on Evacuation Planning and Mapping has established with regards to this programme, as well as the interest in the new PTWS course Tsunami Evacuation, Maps, Plans, and Procedures (TEMPP) and Tsunami Ready among some Member States;

Recognizing the critical contribution of the Oceania Regional Seismic Network (ORSNET) to the PTWS and appreciating the French government's contribution that helped establish this key network and the intention of the Vanuatu Government to continue to administrate the network pending availability of resources;

Requests ORSNET Member Countries and other PTWS Members States to urgently seek funding resources with relevant development partners to sustain this important network;

Encourages Member States to implement training events with development partners on how to utilize available tools to strengthen their tsunami preparedness and warning operations;

Noting the significant co-investments of several Member States and the additional resources required to fulfil the agreed activities and work programs of the ICG/PTWS in the inter-sessional period (listed in Appendix 2), with the support of the Steering Committee and IOC Secretariat, **urges** Member States and funding agencies to make extra-budgetary contributions;

Encourages the identification of resources and/or collaborations in order to implement a deep ocean sea level monitoring network in the South Eastern Pacific region;

Recognizing the limited capacity of many Member States of the PTWS in: (i) tsunami risk assessment and reduction; (ii) tsunami detection, warning and dissemination; and (iii) tsunami awareness and response,

Encourages Member States, donors and development partners to re-commit to investing with resources to sustain and enhance national tsunami warning and mitigation systems and community preparedness;

Requests Member States to promptly inform the Secretariat of all changes to their Tsunami National Contacts (TNCs), National Tsunami Warning Centres (NTWCs), and Tsunami Warning Focal Points (TWFPs) through official channels;

Noting the importance of seismic data for timely and accurate determination of tsunami threats by Tsunami Service Providers (TSPs), **requests** Member States to provide all relevant seismic data in real-time to the TSPs and international seismic data centres and to ensure station calibration and metadata are kept up to date;

Noting the importance of clarifying the earthquake characteristics and tsunami potential in the Pacific Ocean region, **encourages** Member States to acquire and share new datasets such as GNSS, seismic and other geological data;

Requests Member States to share any new forms of sea level data for tsunami warning purposes in accordance with the IOC Oceanographic Data Sharing Policy;

Decides to:

1. Rename WG1 Understanding Tsunami Risk with new Terms-of-Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Members to be nominated by China, France and Palau, elected Co-Chairs are Dr Diego Arcas (USA) and Ms Sarah-Jayne McCurrach (New Zealand);
2. Continue WG2 Tsunami Detection, Warning and Dissemination with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Members to be nominated by Australia, France, Japan, New Zealand, Samoa, Tonga, USA, Vanuatu, ITIC, elected Chair is Dr Ken Gledhill (New Zealand), elected Vice Chair is Dr Charles McCreery (USA);
3. Dissolve WG2 Task Team on Enhancing Products;
4. Continue WG2 Task Team on Seismic Data Sharing in the Southwest Pacific with revised Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Members to be nominated by South Pacific Countries and territories (Australia, Fiji, France–French Polynesia, France-New Caledonia, New Zealand, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu), PTWC, USA, elected Co-chairs are Ms Eslie Garaebiti (Vanuatu) and Mr Pierre Lebelleguard (France, New Caledonia);
5. Rename WG3 Disaster Risk Management and Preparedness with revised Terms-of-Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Members to be nominated by China, Cook Islands, Palau, Panama, Solomon Islands, Samoa and Vanuatu, elected Chair is Mr David Coetzee (New Zealand), elected Vice Chair is Dr Laura Kong (USA);
6. Continue Sub-Regional Working Groups and Task Teams with same Terms of Reference except where noted:
 - *Regional Working Group on Tsunami Warning and Mitigation System on the Central American Pacific Coast*, Chair and vice-chair to be elected by the Group; The Terms of Reference for this group remains unchanged;
 - *Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region*; Chair Mr Diego Gago (Peru) and Vice-Chair Ms Maria

Rengifo (Colombia) with revised Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1;

- Regional Working Group on Tsunami Warning and Mitigation System in the South West Pacific Region renamed *Pacific Island Countries and Territories Regional Working Group on Tsunami Warning and Mitigation System*, to include Pacific Countries and Territories outside the Southwest Pacific; with revised Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Members to be nominated by all Pacific Island Countries and Territories (PICTs), Council of Regional Organizations in the Pacific (CROP) Agencies, Australia, New Zealand, ITIC and PTWC, elected Chair is Mr Ofa Faanunu – (Tonga) , elected Vice Chair is Dr Jerome Aucan (France- New Caledonia);
 - *Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region*. Chair Mr. Chan Sai-Tick (China) and Vice-Chair to be elected; The Terms of Reference for this group remains unchanged;
7. *Task Team of the Regional Working Group on Tsunami Warning and Mitigation in the South China Sea Region on Establishment of a South China Sea Tsunami Advisory Center*. Chair Dr Yuan Ye (China) and Vice-Chair to be elected; The Terms of Reference for this group remains unchanged;
 8. *Task Team on Future Goals and Performance Monitoring* with modified Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1. Chair Mr Rick Bailey (Australia) and Vice-Chair Ms Sarah-Jayne McCurrach (New Zealand);
9. Continue the *PTWS Steering Committee* with same Terms-of-Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1;
 10. Dissolve *Task Team on Evacuation Planning and Mapping*;
 11. Establish a *Task Team on Tsunami Evacuation Maps, Plans, and Procedures (TEMPP), and Tsunami Ready*, with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1; Members to be nominated by Cook Islands, Mexico, Samoa, Solomon Islands, Tonga and Vanuatu. Chair Dr Laura Kong (ITIC, USA), Co-chair Mr Willington Renteria (Ecuador);
 12. Establish a *Pacific Island Countries and Territories Working Group Task Team on Capacity Development*, with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1 Co-chairs Mr Mulipola Ausetalia Titimaea (Samoa) and Mr Ofa Faanunu (Tonga);
 13. Establish a *Task Team on PacWave18 Exercise* with Terms of Reference as attached in Appendix 1 to Recommendation ICG/PTWS-XXVII.1, Members to be nominated by Australia, China, Japan, Nicaragua, Panama Tonga, USA, PTWC; Co-chairs: Ms. Jo Guard (New Zealand) and Dr Laura Kong (ITIC, USA);

Encourages Member States to nominate members for the three technical Working Groups, for the sub-regional Working Groups, for the Task Teams and request IOC Secretariat to contact the nominated Member States to provide details of their representatives;

Requests Member States to participate more actively in the activities of the Working Group 3 on Disaster Management, and Preparedness, with specific emphasis on the involvement of social scientists and disaster managers;

Encourages all Working Groups and Task Teams keep continuous discussion via emails and teleconferences during the intersessional period to maximize the outcome of the session;

Decides to hold joint inter-sessional meetings of Technical Working Groups, Sub-regional working groups, Task Teams and the Steering Committee;

Encourages the participation of regional Disaster Management Organisations as Observers to the ICG/PTWS Steering Committee and relevant Working Groups and Task Teams where appropriate, as well as joint working groups and meetings with other regional organisations/programmes as appropriate;

Decides to continue to disseminate a communication test message from the PTWC once a month on the same day and at the same time every month and two random unannounced tests annually to the PTWS Member States. NTWCs and TWFP **must** respond or risk removal from future communication tests;

Noting requests from Member States in the Pacific Islands and the Americas to restart the NOAA PTWC Heads-up SMS service, discontinued in October 2014 with the start of PTWC Enhanced Products;

Welcomes and **appreciates** the USA's offer to restart the SMS alert service as a two-year trial for PTWS Member States;

Requests the USA to work with the IOC Secretariat to contact TNCs to identify appropriate national officials for participation in this trial;

Decides to move the next biennial PacWave to the months of September through to November 2018 to support International Disaster Risk Reduction Day (13 October) and World Tsunami Awareness Day (5 November), and to establish a Task Team on PacWave18 under the Steering Committee;

Noting that World Tsunami Awareness Day (WTAD) is an annual commemoration under the UNISDR that started in 2016, and will be held on 5 November every year,

Requests that the IOC Secretariat to send a Circular Letter to Member States to invite them to observe WTAD in ways that generate public attention to tsunami risk and preparedness;

Noting the Sendai Framework for Action, recommends Working Group 1 Understanding Tsunami Risk and Working Group 3 Disaster Management and Preparedness to strengthen the synergies with the Regional Working Group on Tsunami Warning and Mitigation System in the South East Pacific Region in order to provide the necessary support to properly adopt the Tsunami Ready program in the region,

Endorses the recommendations of the South China Sea Regional Working Group on Trial and Full Operation of the South China Sea Tsunami Advisory Centre (SCSTAC) with target date and specific arrangement as contained in [Recommendation ICG/PTWS-XXVII.3](#);

Instructs the Task Team on Future Goals and Performance Monitoring to finalise the draft ICG/PTWS Framework for Goals and Performance Monitoring of Tsunami Warning & Mitigation Systems, following feedback from the other ICGs;

Instructs the Task Team on Future Goals and Performance Monitoring to develop a PTWS Status report for reporting status and performance for the next meeting of the ICG/PTWS;

Instructs the Steering Committee to use the ICG PTWS Framework for Goals and Performance Monitoring of Tsunami Warning & Mitigation Systems for managing the activities of the ICG in the inter-sessional period;

Requests Member States to use the new National Report Template for providing information required for status and performance monitoring;

Instructs the WG2 Task Team on Seismic Data Sharing in the Southwest Pacific to investigate an efficient mechanism for sharing ORSNET data with national warning centres and TSPs, including non-ORSNET countries, for the purpose of issuing tsunami warning products only;

Recognizing the importance of effective and consistent threat message dissemination simultaneously over many warning communication systems to many applications,

Recommends TSPs and NTWCs use the Common Alerting Protocol (CAP) to facilitate the messages dissemination process;

Recognizing the importance of continuing to improve tsunami detection and the sustainability of the system,

Instructs Working Group 2 to review the sensing network of the PTWS and develop an optimal (defined by functional, resourcing and capability requirements) multi-instrument design that integrates emerging techniques and sensor technologies (e.g. better use of tide gauges; GNSS technology and processing; sensors on telecom cables) with the existing sensing network to meet tsunami warning service requirements. This investigation should include cost-benefit analysis of the potential technologies being considered;

Recognizing the importance of the effective operation of NTWCs for timely tsunami warning,

Instructs Working Group 2 to establish by mid-2018, the minimum competency level for NTWC operations, by identifying a) what competencies are required and b) what training schemes are currently in existence and what guidelines and principles can be adapted for this purpose. WG2 to report progress to the Steering Committee;

Recognizing the current technical limitations of producing timely and accurate forecasts of local tsunami events;

Noting that while TSPs will seek to monitor for, detect, and provide threat advice for all tsunamis within their respective areas of responsibility they will not always be able to provide guidance in sufficient time and/or accuracy in the case of local source tsunamis. Member States should fully consider this constraint in their local tsunami response SOPs. Therefore ICG/PTWS countries should reaffirm the best mechanism for responding to local source tsunami is public education and ensuring their understanding and response to natural warning signs,

Instructs Working Group 2 to develop guidelines and SOPs to inform the “best practice” response to these local tsunami events;

Noting the success of the International Tsunami Workshop: Recent Tsunamis in the Pacific - Improving Tsunami Response, which allowed rich scientific discussion prior to the ICG and helped inform discussions and decisions of the ICG, **recommends** a similar symposium be organised to precede the 2019 ICG PTWS session. The organising committee shall consist of Nicaragua, Australia, Chile China, France, Japan, New Zealand, Tonga and ITIC;

Recognizing the diligent investments of many nations to develop sub-regional warning networks and local forecast capabilities, the model of PTWS TSPs engagement between one another has been based upon technical discussions between these emerging leaders in warning,

Recommends the Steering Committee examine the governance of this emerging structure to coordinate monitoring hazards and areas of service. The Steering Committee would develop revised definitions of service providers and recipients to reflect the new forecast, sensing, and warning capabilities of the PTWS, ensuring coordination of data and guidelines for service delivery in the basin; a draft Governance Service Model should be available for the ICG to review at its 28th session;

Encourages all participants to the ICG/PTWS develop and post documents for the next Session as early as possible, preferably at least one month prior to the beginning of the Session, for improved preparation for the Session. Member states should make their presentation to plenary as brief as possible and to the point, to leave enough time for discussion among all participants to the session;

Requests the Executive Secretary to:

1. Write to the Member States annually requesting updates to TNC, NTWC and TWFP contact details, and advise them of the procedures for updating contact details;
2. Circulate a template for national report prior to each session of the ICG/PTWS;

Expresses its gratitude to the Government of France and the Government of French Polynesia for kindly hosting the International Tsunami Workshop: Recent Tsunamis in the Pacific—Improving Tsunami Response and the 27th Session of the ICG/PTWS in Tahiti, French Polynesia;

Noted the importance and value of coordination of services and activities between ICGs, especially for those countries belonging to two ICGs;

Accepts with appreciation the kind offer of Nicaragua to host the 28th Session of the ICG/PTWS in 2019 and **instructs** the Secretariat to coordinate dates with ICG/CARIBE-EWS and ICG/IOTWMS to avoid conflicts in timing.

Financial Implications: None

Appendix 1 to Recommendation ICG/PTWS-XXVII.1

Terms of Reference

Working Group 1: Understanding Tsunami Risk

1. Develop and promote best practice tsunami risk reduction material, programmes, standards and tools for understanding tsunami risk, to support emergency management and early warning, including but not limited to:
 - hazard assessment and coastal inundation models and products
 - risk assessment methodology and risk forecasting

- scenario assessments including maximum credible and most likely events to understand likely exposure, vulnerability and event frequency
 - forecast and threat models
 - evacuation and inundation modelling
 - use of new and improved data including Digital Elevation Modelling (DEM), GNSS and paleotsunami information
2. Work with International Union of Geodesy and Geophysics (IUGG) and other scientific bodies to ensure the translation of science information to support tsunami risk assessment and risk reduction. Develop recommendations for IUGG and other scientific bodies on science gaps in hazard assessment capability.
 3. Better understand and develop best practice for assessing and reducing the risk of local source and non-seismic tsunami sources.
 4. Develop projects in conjunction with subject matter experts and groups with specific interest to address gaps or areas for improvement in tsunami risk assessment and risk reduction.
 5. Provide hazard specific support and advice to other ICG/PTWS working groups and working groups from other ocean basins, as well as other working groups to understand, coordinate and develop ways to address tsunami risk management.

The Group will be composed of members nominated by Member States, with two co-chairs, one from a science and one from a disaster risk management background, to be elected.

Terms of Reference

Working Group 2: Tsunami Detection, Warning and Dissemination

Liaise with other working group(s) and Task Team(s) within the ICG/PTWS and with working groups from the other ocean basins through the TOWS-WG to:

1. Develop, coordinate and enhance operational implementation of interoperable tsunami threat information products and services.
2. Undertake studies to determine warning requirements for seismic and sea level data.
3. Monitor and report on the performance of key observational, warning and communication system components.
4. Contribute to the conduct of regular exercises and communication tests of the PTWS.
5. Identify areas of priority for action following assessments, communications tests, exercises and real tsunami events.
6. Develop and maintain relevant documentation, such as the PTWS Users Guide.
7. Provide advice to the International Tsunami Information Centre (ITIC) on educational materials about the warning systems and services.
8. Help strengthen the capacity and capability of Member States.

The Working Group will be composed of members nominated by Member States, Member State representatives for each ICG designated TSPs, and invited observers, with a Chair and a Vice-Chair to be elected by the ICG.

Terms of Reference

**WG2 Task Team
on Seismic Data Sharing in the South West Pacific**

1. Advocate seismic data sharing in the region.
2. Advise South West Pacific countries on data sharing protocols, techniques and technologies.
3. Work with South West Pacific Countries and donors to ensure a common data sharing policy.
4. Encourage South West Pacific Countries with existing or planned broadband seismograph stations to join the International Federation of Digital Seismograph Networks (FDSN), use the standards developed by the FDSN for data exchange and take advantage of the data archiving provided by the FDSN

Members are representatives of South Pacific Countries and territories (Australia, Fiji, France – French Polynesia, France-New Caledonia, New Zealand, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu), PTWC, USA.

Terms of Reference

**Working Group 3:
Disaster Risk Management and Preparedness**

1. Facilitate in collaboration with TOWS Task Team on Disaster Management and Preparedness and organizations such as UNISDR, the exchange of experiences and information on risk reduction and preparedness actions, and matters related to disaster management.
2. Promote preparedness in coastal communities through education and awareness products and campaigns.
3. Facilitate SOP training across regions to strengthen emergency response capabilities of Member States and their Disaster Management Offices.
4. Develop and promote best practice preparedness material, programmes and assessment tools.
5. Promote tsunami risk reduction theory and practice.
6. Support the ITIC of the ICG;

The Group will be composed of members nominated by Member States, a representative of ITIC with a Chair and a Vice-Chair to be elected.

Terms of Reference

Working Group for the Central American Pacific Coast

1. To assist the Central American countries in the development, improvement and implementation of their National Tsunami Warning and Mitigation Systems, and the countries which are becoming new members of ICG/PTWS in their integration into the ICG/PTWS.
2. To request CEPREDENAC to support the development of CATAC in Nicaragua as interim Regional Tsunami Advisory Centre for all Central American countries.
3. To implement a regional communications and warning plan.
4. To facilitate Tsunami Hazard and Risk studies in the Central American Region.

The Group will be composed of members from Member States Nicaragua, El Salvador, Guatemala, Costa Rica, Honduras, Mexico and Panama, with a Chair and a Vice-Chair to be elected.

Terms of Reference

Working Group for the South East Pacific Region

1. To identify current gaps on the warning and mitigation capabilities of countries in the South East Pacific Region based upon the lessons learned from the latest tsunami events. To increase understanding of tsunami risk and to identify the requirements from countries in the Southeast Pacific Region for the tsunami warning and mitigation, following the Sendai framework priorities as a reference.
2. To promote regional activities and join projects considering in-region capacity building and enhancing disaster preparedness for response as main efforts, according to the priorities number 1 and 4 of the Sendai framework.
3. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks and communication systems in the region, and their interoperability in accordance with ICG/PTWS requirements, through the active participation of appropriate national delegates from Member States, in the Working Group 2: Tsunami Detection, Warning and Dissemination.
4. To improve the educational programs with a regional criteria based on the regional social, cultural and economic reality, through the active participation of appropriate national delegates from Member States, in the Working Group 3 Disaster Management and Preparedness.
5. To facilitate capacity building and the sharing of sea level, seismic and GNSS information, among others, in the region, including the free and open exchange of data.
6. To develop synergies with universities and academic centres to promote and to facilitate the regional tsunami research in order to cope with regional needs.
7. To improve the communication channels between the countries, according to the program established in 2013 of periodical tests using redundant systems.

8. To analyze the convenience of piloting Tsunami Ready program in the region.

The Group will be composed of representatives nominated by the Member States of Colombia, Ecuador, Peru and Chile, with a Chair and a Vice-Chair from each country rotating every two years.

Terms of Reference

Pacific Island Countries and Territories Working Group on Tsunami Warning and Mitigation

1. To continually review and evaluate capabilities of and make recommendations for improvements to countries in the Pacific Islands and Territories (PICT) Region for providing end to-end tsunami warning and mitigation services.
2. To support the involvement and contribution of PICT countries in the activities of the ICG/PTWS.
3. To promote and facilitate the tsunami hazard and risk studies in the PICT region.
4. To facilitate cooperation in the establishment and upgrading of seismic and sea level stations and networks in the region, and the interoperability of these systems in accordance with ICG/PTWS requirements.
5. To facilitate training and capacity building in the end to end tsunami warning and mitigation system in the region.
6. To encourage the sharing of tsunami information, including but not limited to the free and open exchange of data.
7. To facilitate tsunami awareness in school curricula, and development and dissemination of public educational materials.
8. To work in cooperation with PTWS Working Group 2 & 3, and relevant task teams especially on activities that strengthen country capacity in tsunami warning, risk mitigation & emergency response.

The Group to be comprised of representatives from Pacific Island Countries and Territories (PICTs) as members, Council of Regional Organizations in the Pacific (CROP) Agencies and WMO Regional Association V (RAV) as observers with Chair and Vice Chair to be elected by the members of the Working Group and endorsed by the ICG/PTWS.

Terms of Reference

Pacific Island Countries and Territories Working Group Task Team on Capacity Development

1. Carryout a capacity mapping of existing warning and mitigation capabilities in the PICTs and report outcomes to the Pacific Island Countries and Territories Working Group and WG2

2. Develop competency guidelines for tsunami warning personnel for the PICTs and report outcomes to the Pacific Island Countries and Territories Working Group and WG2
3. Pilot the Tsunami Ready program in Tonga, Samoa, Vanuatu and report outcomes to the Pacific Island Countries and Territories Working Group and Task Team on Tsunami Evacuation Maps, Plans, and Procedures (TEMPP) and Tsunami Ready
4. Develop warning guidelines for national tsunami warning centers in PICTs on local tsunami and report outcomes to the Pacific Island Countries and Territories Working Group and WG2

Members: Australia, Cook Islands, France - French Polynesia, France- New Caledonia, New Zealand, Vanuatu, Solomon Islands, ITIC, SPREP, SPC, PTWC.

Terms of Reference

Working Group for the South China Sea Region

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.

The Group will be composed of members nominated by Member States Brunei, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam and invited experts with a Chair and Vice-Chair to be elected.

Terms of Reference

South China Sea Sub-Regional WG Task Team on Establishment of a SCS Tsunami Advisory Center

1. Develop capability guidelines and performance indicators for the SCSTAC.
2. Explore ways for facilitating the sharing and exchange of data and relevant information necessary for the establishment of the SCSTAC.
3. Consult with National Tsunami Warning Focal Points of the SCS region to determine appropriate requirements for Tsunami service/products.

4. Develop the SOP and the contents of tsunami advisory products for the SCSTAC.
5. Identify potential resource requirements for the establishment of the SCSTAC.
6. Keep contact with PTWC and NWPTAC (JMA) for technical guidance and assistance.

Membership: Representatives of Member States of the ICG/PTWS WG-SCS (Brunei Darussalam, China, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand and Vietnam) and invited experts; representatives of PTWC and NWPTAC (JMA); with chairperson and vice chairperson to be elected.

Terms of Reference

Steering Committee

1. The Steering Committee shall act in an advisory capacity to the Chair of the ICG/PTWS during the inter-sessional period.
2. The Steering Committee shall coordinate and integrate the work of ICG/PTWS in the inter-sessional periods, as implemented through the various technical and regional working groups and task teams, including but not limited to:
 - Maintain the PTWS Medium Term Strategic Plan
 - Monitor, maintain and update the PTWS Implementation Plan
 - Develop a Strategy for funding PTWS activities
 - Monitor the performance of the PTWS.
3. The Steering Group will be composed of the ICG/PTWS Officers (Chair and three Vice-Chairs), Chairs of the Technical and Regional Working Groups, Directors of PTWC, NWPTAC and ITIC or their representatives, other members' representatives by invitation of the Chair.

Terms of Reference

Task Team on Future Goals and Performance Monitoring

1. Finalise the ICG PTWS Framework for Goals and Performance Monitoring of Tsunami Warning & Mitigation Systems, to be harmonised with other ICGs, for use in the next two inter-sessional periods.
2. Use the outcomes from the 27th Meeting of the ICG/PTWS to establish a performance baseline and a list of activities and resources required to help meet the identified goals.
3. Develop a PTWS Status Report for reporting the status and performance of the PTWS at the next meeting of the ICG.
4. Utilise the new National Report template for Member States to collect the required information and determine performance metrics for the PTWS Status Report.

Members consisting of the Working Group Chairs, ITIC, PTWC, USA, and invited experts as observers as appropriate, reporting to the Steering Committee and chaired by Mr Rick Bailey (Australia), Vice-Chair Ms Sarah-Jayne McCurrach (New Zealand).

Terms of Reference

**Task Team on Tsunami Evacuation Maps, Plans, and Procedures (TEMPP)
and Tsunami Ready**

1. Finalize the new PTWS training programme, on Tsunami Evacuation Maps, Plans, and Procedures (TEMPP), aimed at facilitating tsunami resilience through community preparedness for tsunami-vulnerable coastal communities. A pilot, was conducted in Honduras for Central America between 2015 and 2017, led by the ITIC.
2. Complete the final Programme globally applicable and utilize standardized tools and methodologies where they exist, consider best practices worldwide, and link existing training workshops, such that modules cover:
 - o Evacuation Planning
 - o Evacuation Map Development (inundation modelling and map creation)
 - o Tsunami Warning & Emergency Response SOPs
 - o Conducting Tsunami Exercises (including evacuation)
3. The final programme should be suitable for publication of an IOC Manual and Guide on Evacuation Plans, Maps, and Procedures, in cooperation with the Task Team.
4. Facilitate the piloting of the current CARIBE-EWS Tsunami Ready guidelines, as recommended by the TOWS WG (Feb 2017) for reporting back to the next PTWS with a view to develop PTWS guidelines.
5. Take advantage of the TEMPP Process in piloting the Tsunami Ready community recognition program.
6. Pilots should provide feedback on the applicability of the CARIBE-EWS Guidelines for the PTWS, including consideration to
 - a) Advise on contextualizing awareness and outreach, and exercise guidelines so that they appropriate for national implementation at the community level
 - b) Advise on roles and responsibilities, effectiveness and recognition process for programmes implemented in both small and large countries.
 - c) Advise on the recognition period and renewal requirements, and on Tsunami Ready programme sustainability
7. Compile the results from pilots for reporting progress to the TOWS WG and the next ICG/PTWS.

Membership to open to all PTWS Member States, include Member States interested in TEMPP and Tsunami Ready, reporting to the PTWS Steering Committee and Chaired by Dr Laura Kong (ITIC, USA), Co-Chair Willington Renteria (Ecuador).

Terms of Reference

Task Team on PacWave18 Exercise

1. Design and carry out an eighth Exercise Pacific Wave 2018 with the following characteristics:
 - An exercise shall be conducted to
 - a) Maintain familiarity with PTWC products
 - b) Validate of the NWPTAC new enhanced products
 - c) Support the development of tsunami procedures and products by the South China Sea Tsunami Advisory Center (SCSTAC).
 - d) Test operations and community response in real time using past real events where possible.
2. Exercise Pacific Wave 2018 (PacWave18) will:
 - Take place in the months of September through to November 2018 to support International Disaster Risk Reduction Day (13 October) and World Tsunami Awareness Day (5 November).
 - Be conducted as a Pacific-wide exercise involving all PTWS countries as part of the regular biennial Pacific Wave exercise conducted since 2006.
 - Be conducted to include exercise activities over and above a table top exercise. Possible exercise variations include:
 - a) Using real events where possible
 - b) Consider conducting in real time during the daytime working hours with full staffing, or simulating minimal staff during night time or weekend hours
 - c) Consider joint exercises involving neighbouring countries organized through the PTWS Regional Working Groups.
 - d) Consider conducting the exercise down to the community level, including where possible including an extensive public awareness campaign.
 - e) PTWC, NWPTAC, SCSTAC Communications Test will be held on 5 November (World Tsunami Awareness Day).
 - The aim and objectives of the exercises will be finalized by the PTWS Chair in consultation with the Steering Committee.
 - The exercise shall be announced by the IOC to Member States at least 240 days in advance of the exercise date.
 - The exercise manual including instructions to Member States regarding their participation and the evaluation instrument be prepared with content and structure similar to what was prepared for previous Pacific-wide exercises, but taking into account lessons learned and any need to collect additional information.
 - The exercise manual and products will be distributed by the IOC to Member States at least 180 days in advance of the exercise date. The manual should include instructions to Member States regarding the exercise conduct and the evaluation instrument.
 - Participating Member States will be asked to complete and return the evaluation instrument no more than 21 days following the exercise.

3. Prepare the Summary Report for the exercise, compiling a list of recommendations and the list of actions from the findings for consideration by the ICG/PTWS-XXVIII.
4. Members invited from the ICG/PTWS Member States. Task Team co-chairs: to be elected by the ICG.

Appendix 2 to Recommendation ICG/PTWS-XXVII.1

Inter-sessional ICG/PTWS Budget & Programme
For 2017-2019:

In-kind Co-investments and Extra-Budgetary Requirements

Activity	Approx. co-investment by MS and UNESCO	Extra-Budgetary resources required	Year of expenditure
UNESCO/IOC Secretariat Support- Regular budget every 2 years	US\$150K/2yr		2017 2018
International Tsunami Information Centre (USA) annually	US\$600K/yr		2017 2018 2019
ITIC Programme Officer support (Chile)	US\$90K/yr		2017 2018 2019
Pacific Tsunami Warning Centre (USA)	US\$3.0M/yr		2017 2018 2019
NW Pacific Tsunami Advisory Centre (NWPTAC) (Japan)	US\$300K/yr		2017 2018 2019
South China Sea Tsunami Advisory Centre (SCSTAC) (China)	US\$200K/yr		2017 2018 2019
SOP training for South China Sea Tsunami Advisory Centre (SCSTAC) (China)	US\$15K		2018
Support for development of Central America Tsunami Advisory Centre (CATAC)(Japan/JICA and Nicaragua)	Japan US500K/yr Nicaragua US30k/yr		2017 2018 2019
RANET and SMS Pilot Project Heads UP Alert (USA)	US\$TBD		2017

Activity	Approx. co-investment by MS and UNESCO	Extra-Budgetary resources required	Year of expenditure
World Development Bank Projects for Development of the Multi-hazard Early Warning Systems – training and equipment (Samoa, Tonga)	US\$?		
TEMPP and TSU-CAT development	US\$ 100/yr		2017 2018 2019
WG-SCS Sea level operator training in SCS	US\$10K	US\$15K	2017
WG2 Optimal Network Design Workshop		US\$50K	2018
WG2 Development of Tsunami Warning Centre Competency Training Program Workshop		US\$25K	2017
WG2 NTWC Training (five countries not conducting TEMPP/Tsunami Ready)		5x US\$25K = US\$300K	2017 2018 2019
WG3 Tsunami Ready Pilots (6 countries)		6x US\$50K = US\$300K	2017 2018 2019
WG3 TEMPP Programme management and delivery (6 countries)		6x US\$150K = US\$900K	2017 2018 2019
SW Pacific WG Training Workshop two workshops (ORSNET, Seismology, etc)		US\$60K x2	2017 2018
SW Pacific WG SOP Training (for 5 countries: Nauru, Kiribati, Tuvalu, Fiji, Niue)		US\$35Kx5	2017 2018 2019
SE Pacific WG Tsunami Diploma Training Program (seeking sponsorship for participation), Pontificia Universidad Católica de Valparaíso, Chile		US\$15K	2017/18

Activity	Approx. co-investment by MS and UNESCO	Extra-Budgetary resources required	Year of expenditure
SE Pacific WG SOP in region training workshop in 2018		US\$60K	2017 2018

Recommendation ICG/PTWS-XXVII.2

NWPTAC Enhanced Products for PTWS

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recalling the ICG/PTWS-XXVI agreed that the Northwest Pacific Tsunami Advisory Center (NWPTAC) should proceed with its development of enhanced products for the North West Pacific,

Noting the PTWC Enhanced Tsunami Products successfully entered into operation on October 2014,

Acknowledging with appreciation the efforts of the NWPTAC in developing and testing the Enhanced Tsunami Products,

Noting NWPTAC has been distributed exclusively to national authorities of user countries as an advisory for the authorities to alert the people and to announce evacuation notices at their own responsibility,

Endorses the NWPTAC Enhanced Tsunami Products and recommendations by the WG2 Task Team on Enhanced Products as presented in the WG2 Report of the Task Team on Enhanced Products attached in ANNEX IV of the Summary Report for ICG/PTWS-XXVII;

Requests the NWPTAC to start issuance of experimental NWPTAC Enhanced Products in parallel with current products in the latter half of 2017; the date for starting issuance should be decided by the Steering Committee and be announced by IOC Secretariat to Member States at least 60 days in advance;

Requests the NWPTAC to set the targeted change-over date around one half to one year from the experimental NWPTAC Enhanced Products provision, which should be decided by the Steering Committee and be announced by IOC Secretariat to Member States at least 60 days in advance;

Requests the NWPTAC to inform the ICG/PTWS Steering Committee of progress on its Enhanced Products preparation as appropriate for the Steering Committee to make decision on the date to start experimental and full issuance of NWPTAC Enhanced Products.

Financial implications: None

Recommendation ICG/PTWS-XXVII.3

**Trial and Full Operation of
South China Sea Tsunami Advisory Centre**

The Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS),

Recalling that the Intergovernmental Oceanographic Commission (IOC) adopted Resolution EC-XLI.6, which encouraged the Member States around the South China Sea and other regional seas, as appropriate, to actively promote the development, establishment and sustained operation of national and sub-regional Tsunami Warning and Mitigation Systems within the framework of ICGs,

Recalling further that the ICG/PTWS adopted Recommendation ICG/PTWS-XXIII.5, which established the Working Group for the South China Sea (WG-SCS), and Recommendation ICG/PTWS-XXIV.4 that decided to establish a sub-regional Tsunami Warning and Mitigation System for the South China Sea region within the framework of ICG/PTWS,

Recalling also that the ICG/PTWS adopted Recommendation ICG/PTWS-XXV.3, which approved the *Proposal for a South China Sea Tsunami Warning and Mitigation System* as the basis for the establishment of the sub-regional Tsunami Warning and Mitigation System within the framework of the ICG/PTWS. Through ICG/PTWS-XXV.3 the ICG/PTWS also decided the establishment of a WG-SCS Task Team on the Establishment of a South China Sea Tsunami Advisory Centre (SCSTAC), with Terms of Reference attached as Annex 1, accepted China's offer to host the SCSTAC and recommended to initiate the establishment of the SCSTAC under the guidance of the WG-SCS;

Having considered the reports of:

1. The third meeting of the ICG/PTWS WG-SCS, held in Hong Kong, China, 8-9 April 2014,
2. The fourth meeting of the ICG/PTWS WG-SCS, held in Jakarta, Indonesia, 11-12 February 2015,
3. The fifth meeting of the ICG/PTWS WG-SCS, held in Manila, the Philippines, 2-4 March 2016,
4. The 2nd Task Team Meeting on the Establishment of the South China Sea Tsunami Advisory Centre (SCSTAC), held in Beijing on 24-26 October 2016,
5. The sixth meeting of the ICG/PTWS WG-SCS, held in Shanghai, China, 1-3 March 2017;

Having further noted that the SCSTAC Tsunami Advisory Products have been tested during PacWave17,

Recognizing the concentrated efforts made by National Marine Environmental Forecasting Centre of China to establish the SCSTAC, with technical guidance of TT-SCSTAC,

Having considered the coordination among PTWC, NWPTAC and SCSTAC on consistency of earthquake parameters in the South China Sea region as follows:

1. Noted that the PTWC, NWPTAC and SCSTAC monitor similar seismic networks from Internet resource, and NWPTAC and SCSTAC focus on their respective coastal areas of responsibility,

2. Noted that either PTWC or NWPTAC takes the priority on determining earthquake parameters at its Area of Earthquake Responsibility (AER),
3. The SCSTAC also uses M_w for tsunami bulletins, as the PTWC and NWPTAC did, and
4. The arrangement to be reached for the trial operation of SCSTAC on the consistency of earthquake parameters among PTWC, NWPTAC and SCSTAC within the South China Sea region,

Having further considered the coordination among PTWC, NWPTAC and SCSTAC that the commencement of trial operation of SCSTAC could be targeted to late 2017, with the specific date to be announced by IOC Secretariat to WG-SCS Member States at least two months in advance,

Decides to commence the trial operation of SCSTAC in late 2017, with specific date to be decided by the Steering Committee of the ICG/PTWS and announced by the IOC Secretariat to WG-SCS Member States through Circular Letter at least 60 days in advance;

Agrees 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;

Requests the IOC Secretariat to proofread the document "Tsunami Advisory Products for the South China Sea Regional Tsunami Warning and Mitigation System", and make the arrangement for publishing;

Aiming to supplement the *Operational Users Guide for the Pacific Tsunami Warning and Mitigation System* with content from SCSTAC when it is put into full operation,

Recognizing the 2007 arrangement for NWPTAC to provide interim tsunami services to the SCS region,

Requests NWPTAC to continue to provide their interim tsunami services to the SCS region in parallel with SCSTAC during its trial operation;

Recommends that the Director of SCSTAC should become a member of the PTWS WG2, and could be considered as a future member of the Inter-ICG Task Team on Tsunami Watch Operations, to secure standardization and harmonization of products across all ICGs and its sub-regions.

ANNEX III

**REPORT OF THE CHAIR
TO ICG/PTWS-XXVII**

From the 26th Session of the ICG/PTWS and the celebration of the 50th Anniversary of the PTWS in Honolulu Hawaii 2015 kindly hosted by the US Government, a lot has progressed despite the challenges with time and resources and the obstacles encountered along the way.

During the intersessional period, a number of activities were implemented in Member States by National Tsunami Warning Centres and Disaster Management Offices, the Working Groups, and Task Teams, and the Tsunami Service Providers which you will hear about throughout this session.

I would like to highlight here some of the key achievements within the intersessional period. The first one is the successful implementation of the Tsunami Ready pilot program in Honduras following the decision of the Steering Committee at its meeting in July 2016 for the Technical Working Group 3 to find out more about the tsunami ready by running a pilot program in the countries that expressed interest during this meeting.

The planning and execution of PACWAVE 16 and 17 exercises is another key achievement by this ICG that needs acknowledgement as it took a lot of effort, time and energy from the Task Team members to put together the scenarios, compile the coordinating instructions and develop evaluation surveys post-PACWAVE simulations and reports.

I would also like to highlight progress made by the Task Team established under the Steering Committee as per the decision made at the 26th Session of this ICG to focus on the development of the Future goals and performance monitoring framework for the PTWS as well as the national report template. A third version of this draft framework and the template for national reporting to the ICG has been made available on the UNESCO IOC website for your review and I would like to encourage you all to go through this document.

In addition, I would like to make mention of the progress made to date by the Task Team for the establishment of the South China Sea Advisory Services established under the Regional Working Group for the South China Sea and the progress made by the NWPTAC in developing its enhanced products for the North West Pacific.

During the intersessional period, two Steering Committee meetings were held. Due to financial resource limitations the Steering Committee decided to conduct one virtual meeting which was held in August 2015 and a face to face meeting which was held in Honolulu Hawaii in June/July 2016. The latter was also the mid-session joint meeting of the Working Groups, Task Teams and the Steering Committee as decided at the 26th Session of this ICG. It is important to note that the Steering Committee meetings is critical to setting the pace and direction of implementation of the decisions of this ICG and as a check point to discuss any issues and monitor the progress of implementation of recommendations from the ICG Sessions.

Some of the Technical and Regional Working Groups and Task Teams were able to meet during the intersessional period and you will hear about these meetings and what came out of them from the reports by the Chairs of these regional working groups and task teams during this session.

Due to national work commitments, I was not able to attend the 28th UNESCO IOC General Assembly that was held in June 2015 and the 10th TOWS Working Group Meeting that was held in Paris France in February 2017 and I would like to thank Mr. Tomoaki Ozaki of Japan who is also one of the Vice-Chairs of this ICG, for presenting the reports of the ICG/PTWS to

these meetings and to the members of the Steering Committee and the Secretariat for assisting with the finalisation of the reports to these meetings. The report to the UNESCO IOC General Assembly and the TOWS Working Group focussed on the priorities and the decisions made at the 26th Session of this ICG.

It is important to bear in mind that realistically, nothing much can be achieved in one or two years due to the on-going challenges and issues in relation to availability of technical and financial resources and changes to the political and operational environment within member states which can have greater impact on national priorities, resource allocation and commitment to progressing improvements to national tsunami warning and mitigation systems as well as what the tsunami service providers can and can't do. The 26th Session of the ICG PTWS placed a lot of emphasis on tsunami preparedness and mitigation, harmonisation of ICG governance and operations to ensure consistency, establishing standards and guidelines for aspects of tsunami warning and mitigation systems that are not well developed or where members states do not have the right capacity and capability to self-assist itself in progressing implementation, and alignment of the ICG's strategic direction and aspirations with the global disaster risk management frameworks such as the Sendai Framework for Disaster Reduction 2015-2030. As the Chair of this ICG, I would like to see our efforts for the next intersessional period to continue on this path, to focus more on preparedness and mitigation programs to further strengthen existing national and local tsunami preparedness and risk reduction programs such as the tsunami ready program; to look at further collaboration and more meaningful partnerships with tsunami training and warning service providers on areas of common interest; to explore feasible avenues to secure technical and financial resources to continue the implementation of programs to improve tsunami readiness of at risk communities; and to put in place a meaningful and smart monitoring and evaluation framework to continue to self-check the tsunami warning and mitigation systems that we have at local, national and regional levels.

In saying this, I would like to encourage all Member States that are being represented at this Session to contribute actively to the discussion and raise issues to help guide the future developments and strategic goals to further strengthen coordination of tsunami related work in Member States through your national tsunami warning centers and civil protection agencies, governance and policy matters for PTWS, the work and focus of any approved Working Groups and Task Teams, Tsunami Service Providers and the Secretariat.

To conclude my report, I would like to express sincere gratitude to the Tsunami Service Providers and your respective Governments for your commitment to continue the provision of this critical service to the Member States of this ICG, the commitment of financial resources and budgetary support, technical expertise, monitoring equipment, and other capacity building initiatives.

I would also like to acknowledge with appreciation the leadership and commitment made by the Government of French Polynesia in particular the local organising committee for organising the International Tsunami Workshop and the arrangements that you have made to make this Session possible.

It is important for the Member States to note that the PTWS Officers and members of the Steering Committee have their national responsibilities which is their priority. Any additional responsibilities assigned to them is added on top of these national responsibilities. I want to thank you the PTWS Officers and the members of the Steering Committee for your dedication and commitment to the tasks assigned to you by this ICG.

Lastly, I would like to thank the Secretariat for your continuous support and guidance to the PTWS Officers, the Steering Committee, Working Groups and Tasks Teams, the Tsunami Service Providers and the Member States.

I look forward to fruitful and productive deliberations throughout this session.

Thank you.

Filomena Nelson
Chair – ICG/PTWS

ANNEX IV

REPORT OF TASK TEAM ON ENHANCED PRODUCTS

Satoshi HARADA (TNC of Japan) on behalf of the Task Team

Introduction

This report of the Working Group 2 Task Team on Enhancing Products is to inform the ICG and WG2 on the status of the development and implementation of enhanced international products being created by the Japan's Northwest Pacific Tsunami Advisory Center (NWPTAC) for the UNESCO International Oceanographic Commission's (IOC's) Pacific Tsunami Warning and Mitigation System (PTWS).

Terms of Reference of this Task Team are:

1. Review the capabilities and plans of the international TWCs with respect to their operational products and product dissemination for the PTWS;
2. Gather feedback from Member States regarding international TWC current and planned product content, format, and dissemination;
3. Consider best practices based on social science as well as the experiences of the Member States;
4. Consider the global harmonization of tsunami warning products and terminology;
5. Develop recommendations to improve current products and /or develop new products.

Membership:- Chip McCreery, Dir PTWC, USA, chair

- Tomoaki Ozaki, Japan, vice-chair
- Yuelong Miao, Australia
- Patricio Carrasco, Chile
- David Coetzee, New Zealand
- Ken Gledhill, New Zealand
- Laura Kong, ITIC, USA

PTWC enhanced products successfully entered into operation on October 2014, and this report focuses on the NWPTAC enhanced products.

Inter-sessional Activities

Exercises

PacWave16

The PacWave16 was conducted on February 1-5, 2016 aiming at evaluating experimental NWPTAC Enhanced Products and identify necessary modifications. Twelve Member States participated in the table-top exercise. NWPTAC Enhanced Products for six tsunami scenarios were used. Feedback on the exercise from participating Member States via an evaluation form was collected and compiled. Although almost all respondents indicated that the format and content of the new enhanced products was satisfactory, the feedback included several requests on revision to the enhanced products. Requests were reviewed by the Task Teams on PacWave Exercises and Enhancing Products in correspondence from the viewpoints of effectiveness and viability. The results of the review are summarized in Appendix I. In the PacWave16 summary report, NWPTAC is recommended to proceed with the preparation of

the NWPTAC Enhanced Products as planned, taking into account several suggestions indicated through the post-exercise evaluation.

PacWave17

The PacWave17 was conducted on February 15-17, 2017 aiming at testing the NWPTAC and PTWC enhanced products, and the preliminary results indicate there is no problem in proceeding with the introduction of the NWPTAC Enhanced Products as planned.

Detailed information on these exercises and their evaluations are contained in the PacWave16 Summary Report (Exercise Pacific Wave 2016. A Pacific-wide Tsunami Warning and Enhanced Products Exercise, 1-5 February 2016. Volume 2: Summary report. IOC Technical Series No 126. UNESCO/IOC 2016 (English only)) and the PacWave17 Preliminary Report.

Meeting of the TOWS Task Team on Tsunami Warning Operations

A meeting of the TOWS Task Team Tsunami Warning Operations was held in Paris in February 2016. Progress on the NWPTAC Enhancing Products was reviewed in this meeting.

Meeting of the Task Team Enhancing Products and PTWS Steering Committee

A meeting of the Task Team Enhancing Products and the PTWS Steering Committee were held in Hawaii in June-July 2016. Progress on the NWPTAC Enhancing Products was reviewed in these meetings.

Update of Forecast Points

At the ICG/PTWS-XXVI meeting in April 2015, NWPTAC introduced draft addition and modification of Forecast Points (FPs) for its Enhance Products, which were in line with FPs of PTWC Enhanced Products. After that, arrangement on Forecast Points (FPs) revision was made during August to November 2016 in correspondence between NWPTA recipient Member States and NWPTAC. In addition, in PacWave16 feedback, there were requests on revision of FPs and Area of Service. After the review of these requests, FPs for the NWPTAC Enhanced Products are planned to be updated as shown in Appendix II.

Revision of Area of Service (AoS)

In PacWave16 feedback, there were requests on revision of Area of Service. After the review of the request, the AoS of NWPTAC Enhanced Products are planned to be revised as shown in Appendix III.

Training issues

Although graphical products will be newly introduced, there are only slight changes in the contents and format of text products. Therefore, specific training has not been conducted. Instead, training materials will be provided to recipient Member States by NWPTAC to promote the understanding of the products. ITIC will also assist with NWPTAC enhanced products training in cooperation with the NWPTAC.

Outline of NWPTAC Enhanced Products

NWPTAC Enhanced Products consist of initial text messages compiled from a pre-established tsunami simulation database and subsequent text messages accompanied by graphical products based on real-time simulation techniques. The products will be distributed exclusively to national authorities of user countries. Text messages will be provided via GTS, fax and email and graphical products will be via email. Sample products are shown in the later chapter of "Sample NWPTAC Enhanced Products". A detailed explanation of each component is given in the Draft Users Guide for the NWPTAC Enhanced Products for the Pacific Tsunami Warning System - Manual on Experimental NWPTAC Enhanced Products for PacWave17.

Text products

The text products contains the earthquake information, tsunamigenic potential, and the list of forecast points with tsunami estimated amplitude (0.3-1m, 1-3m, 3-5m, 5-10m and Over 10m) and arrival time at each forecast point (Appendix II). As tsunami observations become available, the product will include selected ones from coastal gauges.

Graphical Product - Tsunami Travel Time Map

This product shows the estimated travel time based on the earthquake location (hypocenter or centroid) and magnitude determined.

Limitations

Actual arrival times may differ from forecast times for reasons including:

- Tsunami source uncertainty (The area of seafloor deformation is assumed from earthquake location and magnitude.)
- Bathymetry uncertainty around the observation point and elsewhere
- Nonlinear effects on tsunami propagation that are not considered in travel time estimation (Such effects may be more significant in shallow water.)
- Difficulty of determining first-wave arrival times from sea level observation data

Graphical Product - Coastal Tsunami Amplitude Forecast Map

This product shows individual coastal points with coloring based on the forecast tsunami amplitude at each point. The greater of two forecast amplitudes based on a conjugate fault set determined via CMT analysis is used for each point.

Limitations

Actual coastal amplitudes may differ from forecasts for reasons including:

- Tsunami source uncertainties (Two rectangular faults are assumed from CMT analysis.)
- Uncertainties regarding tsunami/coastal interaction (Green's Law is used as a general approximation.)

Results can easily vary by a factor of two due to these uncertainties.

Graphical Product - Deep-Ocean Tsunami Amplitude Forecast Map

This product shows the maximum tsunami amplitude at each place in the deep ocean. It shows how the tsunami is 1) directed away from the tsunami source, 2) focused and defocused by the shape of the seafloor, and 3) dissipated due to spreading. Two maps based on a conjugate fault set determined via CMT analysis are provided.

Limitations

Actual deep-ocean tsunami amplitudes may differ from forecasts due to tsunami source uncertainties (two rectangular faults are assumed from CMT analysis) and other factors.

This map should not be used to estimate coastal tsunami amplitudes or impacts.

Product Issuance Timeline

The timeline of NWTPA issuance shown below is typical but approximate and conservative.

00 h 00 m	A large earthquake occurs in the Northwest Pacific region.
00 h 10 m	The NWPTAC receives an initial text product from the PTWC.
00 h 20 m	The first NWPTAC text product based on information from a tsunami forecast database is issued along with data on preliminary earthquake parameters consistent with those in the initial PTWC message.
	Another NWPTAC text product is issued if the preliminary earthquake parameters are updated.
00 h 40 m	The CMT solution is obtained and real-time simulation is started.
00 h 45 m	Real-time simulation is completed.
00 h 50 m	The second NWPTAC text product and graphical products based on real-time simulation are issued.

Sample NWPTAC Enhanced Products

Sample of NWPTAC Enhanced Products are provided in this section.

First Text Product (when coastal tsunami with heights of 0.3 m or more are expected)

WEPA40 RJTD 240904

TSUNAMI BULLETIN NUMBER 001

ISSUED BY NWPTAC (JMA)

ISSUED AT 0859Z 24 MAR 2017

PART 01 OF 01 PARTS

HYPOCENTRAL PARAMETERS

ORIGIN TIME : 0858Z 24 MAR 2017

PRELIMINARY EPICENTER : LAT 3.0SOUTH LON148.0EAST

EASTERN CAROLINE ISLANDS, MICRONESIA

PACIFIC BASIN

MAG : 8.2

BY PTWC

EVALUATION

THERE IS A POSSIBILITY OF A DESTRUCTIVE OCEAN-WIDE TSUNAMI

THIS BULLETIN IS FOR

EAST COASTS OF PHILIPPINES

NORTH COASTS OF IRIAN JAYA

NORTH COASTS OF PAPUA NEW GUINEA

CELEBES SEA

ESTIMATED TSUNAMI ARRIVAL TIMES AND WAVE AMPLITUDES:

EAST COASTS OF PHILIPPINES

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
LEGASPI	13.2N 123.8E	1257Z 24 MAR	0.3-1M

NORTH COASTS OF IRIAN JAYA

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
MANOKWARI	00.8S 134.2E	1116Z 24 MAR	1-3M
WARSA	00.6S 135.8E	1046Z 24 MAR	1-3M
JAYAPURA	02.4S 140.8E	1002Z 24 MAR	1-3M

CELEBES SEA

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
MANADO	01.6N 124.9E	1304Z 24 MAR	1-3M

AMPL - MAXIMUM AMPLITUDE IN METERS FROM THE UNDISTURBED SEA LEVEL TO THE CREST

IN SOME COASTAL AREAS (PARTICULARLY NEAR THE EPICENTER), TSUNAMI WAVES MAY BE HIGHER AND/OR ARRIVE EARLIER THAN ESTIMATED FOR NEARBY FORECAST POINTS.

AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY.

THE EVALUATION OF TSUNAMIGENIC POTENTIAL AND ESTIMATED ARRIVAL TIMES FOR TSUNAMI WAVES MAY ALSO DIFFER FROM THOSE OF PTWC DUE TO DIFFERENCES IN ESTIMATED EARTHQUAKE PARAMETERS AND THE TSUNAMI FORECAST MODEL.

AUTHORITIES SHOULD REFER TO EARLIER ARRIVAL TIMES FOR GREATEST SAFETY.

THIS WILL BE THE FINAL BULLETIN UNLESS CHANGES IN THE POTENTIAL FOR TSUNAMI GENERATION ARE DEEMED POSSIBLE BASED ON EARTHQUAKE RE-EVALUATION OR REPORTS INDICATING TSUNAMI OBSERVATION ARE RECEIVED.

First Text Product (when coastal tsunami with heights of 0.3 m or more are not expected)

WEPA40 RJTD 102318

TSUNAMI BULLETIN NUMBER 001
ISSUED BY NWPTAC(JMA)
ISSUED AT 2318Z 10 MAR 2017
PART 01 OF 01 PARTS

HYPOCENTRAL PARAMETERS
ORIGIN TIME : 2252Z 10 MAR 2017
PRELIMINARY EPICENTER : LAT07.0SOUTH LON148.3EAST
EASTERN NEW GUINEA, PAPUA NEW GUINEA, REGION
NEW GUINEA AREA
MAG : 6.7
BY PTWC

EVALUATION
THERE IS A VERY SMALL POSSIBILITY OF A DESTRUCTIVE LOCAL TSUNAMI

ESTIMATION AT FORECAST POINTS - NO TSUNAMI WAVES WITH AN AMPLITUDE OF 0.3 METERS OR MORE ARE EXPECTED AT ANY FORECAST POINT.

HOWEVER, IN SOME COASTAL AREAS (PARTICULARLY NEAR THE EPICENTER), HIGHER TSUNAMI WAVES THAN ESTIMATED MAY ARRIVE.
AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY.

THIS WILL BE THE FINAL BULLETIN UNLESS CHANGES IN THE POTENTIAL FOR TSUNAMI GENERATION ARE DEEMED POSSIBLE BASED ON EARTHQUAKE RE-EVALUATION OR REPORTS INDICATING TSUNAMI OBSERVATION ARE RECEIVED.

Second Text Product (with tsunami observations)

WEPA40 RJTD 240934

TSUNAMI BULLETIN NUMBER 002
ISSUED BY NWPTAC(JMA)
ISSUED AT 0929Z 24 MAR 2017
PART 01 OF 01 PARTS

HYPOCENTRAL PARAMETERS (REVISION)
ORIGIN TIME:0858Z 24 MAR 2017
PRELIMINARY EPICENTER:LAT 3.5SOUTH LON148.2EAST
EASTERN CAROLINE ISLANDS, MICRONESIA
PACIFIC BASIN
MAG:8.3
BY PTWC

EVALUATION
THERE IS A POSSIBILITY OF A DESTRUCTIVE OCEAN-WIDE TSUNAMI

THIS BULLETIN IS FOR
EAST COASTS OF PHILIPPINES (REVISION)

NORTH COASTS OF IRIAN JAYA (REVISION)
NORTH COASTS OF PAPUA NEW GUINEA (REVISION)
CELEBES SEA

ESTIMATED TSUNAMI ARRIVAL TIMES AND WAVE AMPLITUDES:

EAST COASTS OF PHILIPPINES

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
LEGASPI	13. 2N 123. 8E	(ALREADY ARRIVED)	
DAVAO	06. 9N 125. 7E	1237Z 24 MAR	1M (ADDITION)

NORTH COASTS OF IRIAN JAYA

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
MANOKWARI	00. 8S 134. 2E	1116Z 24 MAR	0. 3-1M (REVISION)
WARSA	00. 6S 135. 8E	1046Z 24 MAR	1-3M
JAYAPURA	02. 4S 140. 8E	1002Z 24 MAR	1-3M

NORTH COASTS OF PAPUA NEW GUINEA

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
VANIMO	02. 6S 141. 3E	0953Z 24 MAR	1-3M
WEWAK	03. 5S 143. 7E	0931Z 24 MAR	3-5M
MADANG	05. 2S 145. 8E	0935Z 24 MAR	5-10M
MANUS_IS.	02. 0S 147. 5E	0858Z 24 MAR	3-5M
RABAUL	04. 2S 152. 3E	(CANCELLATION)	

CELEBES SEA

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
MANADO	01. 6N 124. 9E	1304Z 24 MAR	0. 3-1M

AMPL - MAXIMUM AMPLITUDE IN METERS FROM THE UNDISTURBED SEA LEVEL TO THE CREST

IN SOME COASTAL AREAS (PARTICULARLY NEAR THE EPICENTER), TSUNAMI WAVES MAY BE HIGHER AND/OR ARRIVE EARLIER THAN ESTIMATED FOR NEARBY FORECAST POINTS. AUTHORITIES SHOULD BE AWARE OF THIS POSSIBILITY.

THE EVALUATION OF TSUNAMIGENIC POTENTIAL AND ESTIMATED ARRIVAL TIMES FOR TSUNAMI WAVES MAY ALSO DIFFER FROM THOSE OF PTWC DUE TO DIFFERENCES IN ESTIMATED EARTHQUAKE PARAMETERS AND THE TSUNAMI FORECAST MODEL.

AUTHORITIES SHOULD REFER TO EARLIER ARRIVAL TIMES FOR GREATEST SAFETY.

MEASUREMENTS OR REPORTS ON TSUNAMI

LOCATION	COORDINATES	ARRIVAL TIME	AMPL
LEGASPI	13. 2N 123. 8E		
		MAXIMUM TSUNAMI WAVE 0810Z 10 JAN	0. 5M

MAXIMUM TSUNAMI WAVE -- HALF THE AMPLITUDE FROM THE TROUGH TO THE CREST

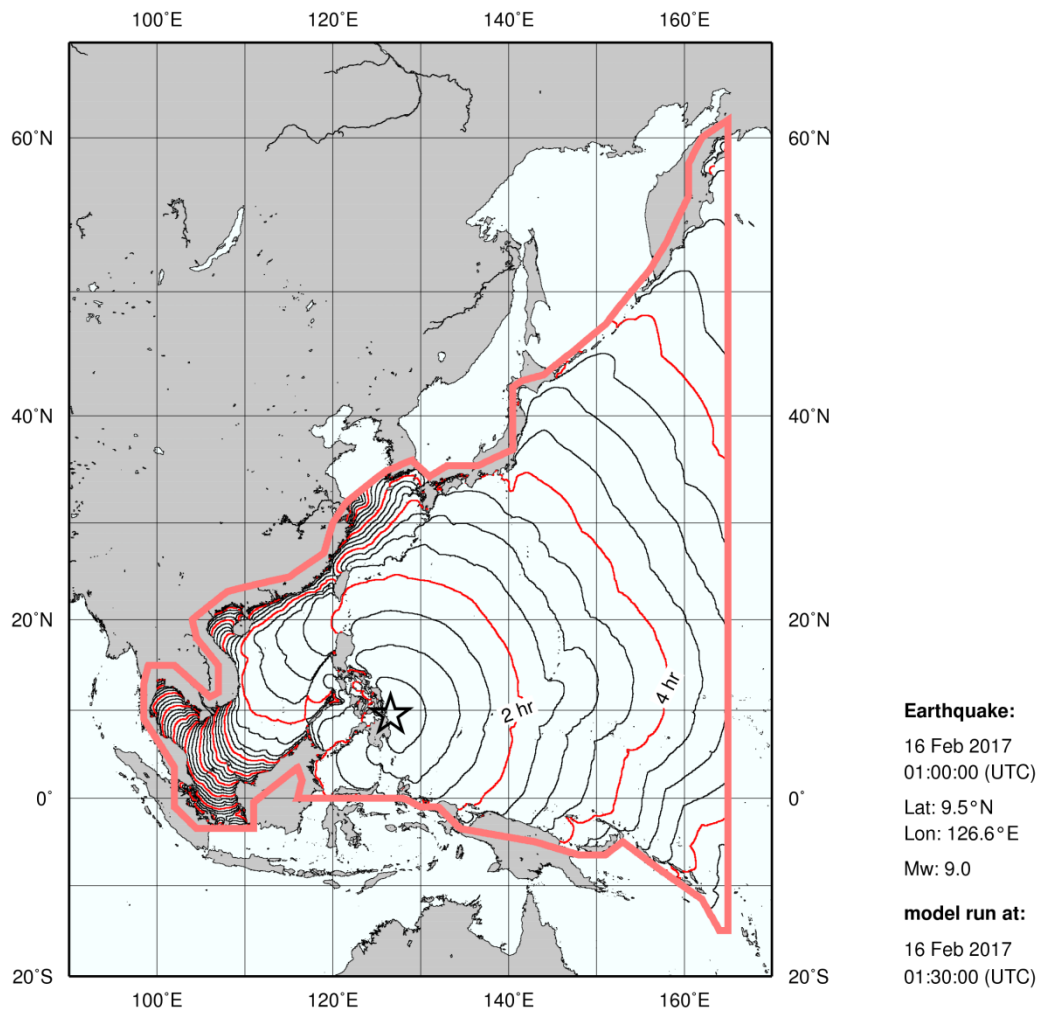
THIS WILL BE THE FINAL BULLETIN UNLESS CHANGES IN THE POTENTIAL FOR TSUNAMI GENERATION ARE DEEMED POSSIBLE BASED ON EARTHQUAKE RE-EVALUATION OR REPORTS INDICATING TSUNAMI OBSERVATION ARE RECEIVED.

Graphical Product

NWPTAC Tsunami Travel Time Forecast

Actual coastal arrival times may differ from forecasts, and initial waves may not be the largest.

Information bulletins provided by the Northwest Pacific Tsunami Advisory Center (NWPTAC) should not be construed as official warnings or evacuation notices for the areas concerned. The issuance of actual evacuation notices is the responsibility of individual local authorities.

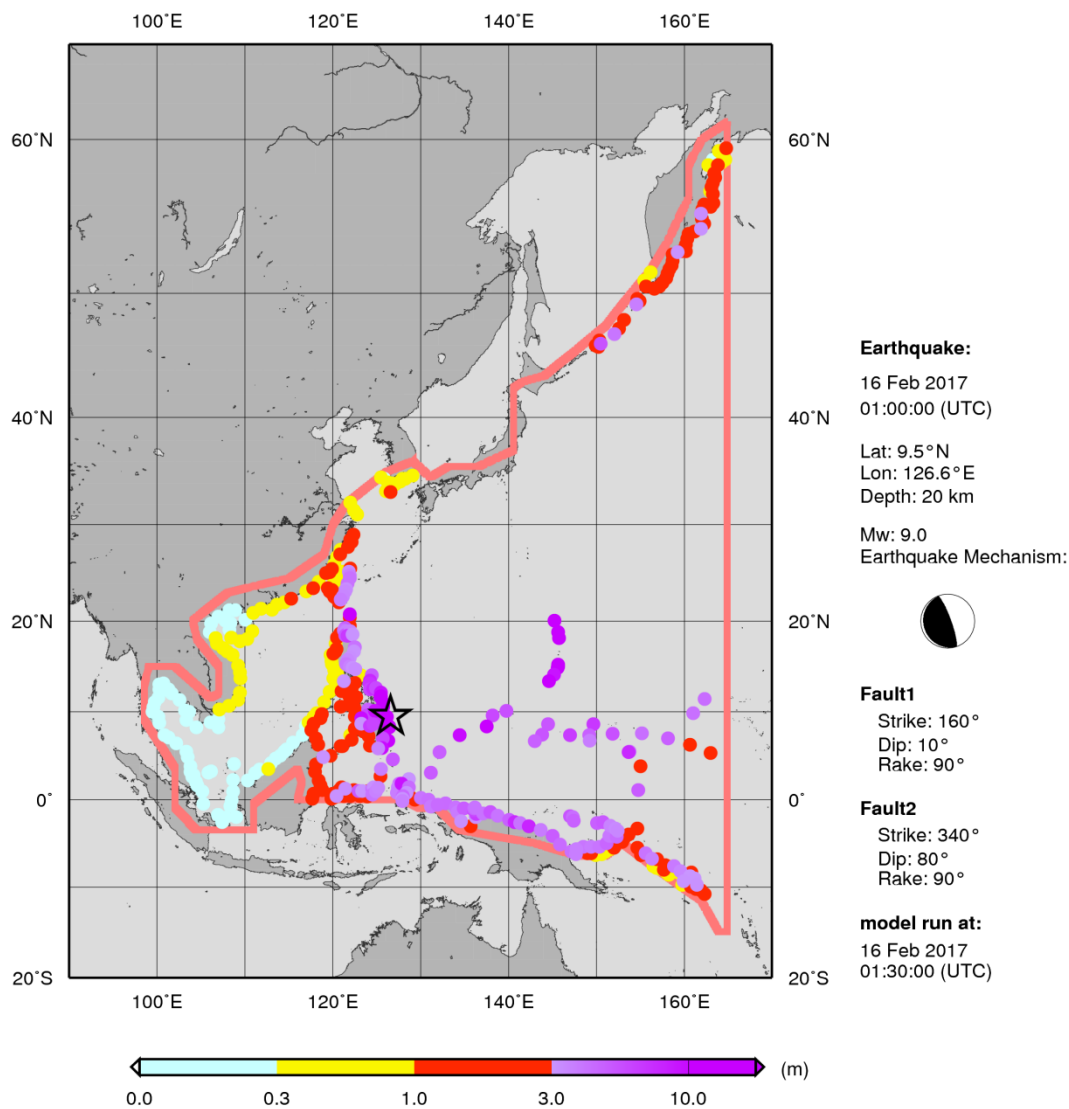


NWPTAC Coastal Tsunami Amplitude Forecast

This map shows the largest maximum coastal amplitudes of two forecasts based on a conjugate fault set obtained from CMT analysis. Values are shown in meters from the undisturbed sea level to the crest.

Actual coastal amplitudes at the coast may differ from forecasts due to forecasting uncertainties and local topography.

Information bulletins provided by the Northwest Pacific Tsunami Advisory Center (NWPTAC) should not be construed as official warnings or evacuation notices for the areas concerned. The issuance of actual evacuation notices is the responsibility of individual local authorities.

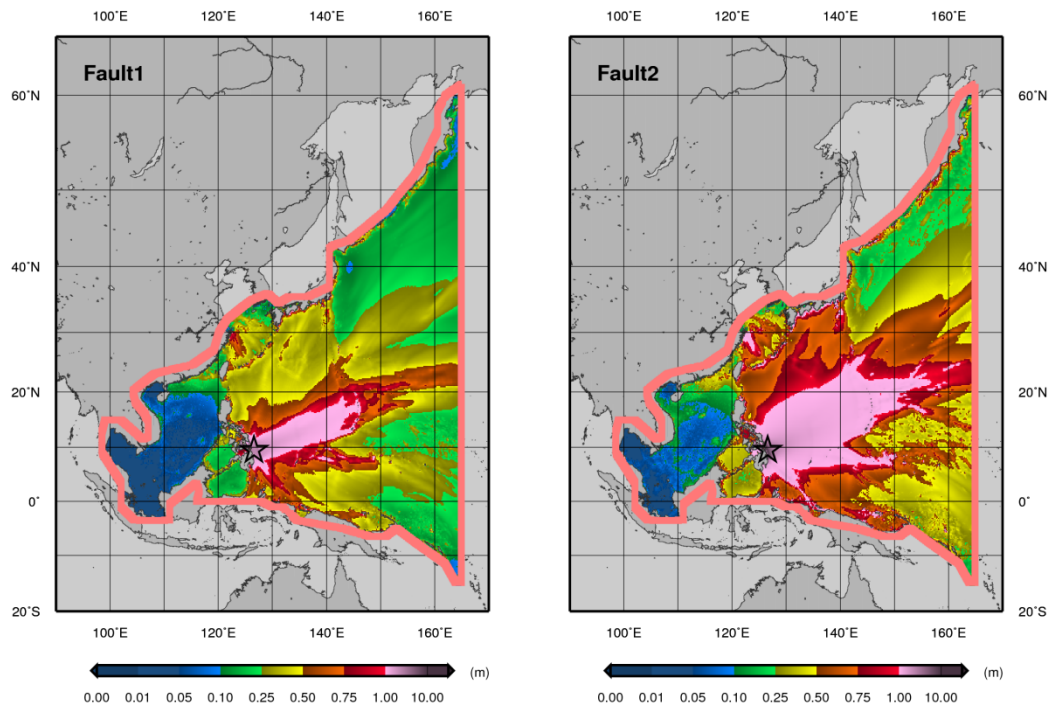



NWPTAC Deep-Ocean Tsunami Amplitude Forecast

The amplitudes shown on these maps are maximum values in meters from the undisturbed sea level to the crest.

Maps should not be used to estimate coastal tsunami amplitudes or impacts. Deep-ocean tsunami amplitudes are usually much smaller than coastal amplitudes.

Information bulletins provided by the Northwest Pacific Tsunami Advisory Center (NWPTAC) should not be construed as official warnings or evacuation notices for the areas concerned. The issuance of actual evacuation notices is the responsibility of individual local authorities.



Earthquake: 16 Feb 2017 01:00:00 (UTC)
Lat: 9.5°N, Lon: 126.6°E, Depth: 20 km
Mw: 9.0
Earthquake Mechanism: 
Fault1 Strike: 160°, Dip: 10°, Rake: 90°
Fault2 Strike: 340°, Dip: 80°, Rake: 90°
model run at: 16 Feb 2017 01:30:00 (UTC)

Task Team Recommendations

Upon review of the aforementioned, the Task Team recommends to the ICG to

1. Start issuance of experimental NWPTAC Enhanced Products in parallel with current products with the target date in the latter half of 2017; the date for starting issuance should be decided by the Steering Committee and be announced by IOC Secretariat to Member States at least 60 days in advance.
2. Set the target changeover date to be around a half to one year from the experimental NWPTAC Enhanced Products provision, which should be decided by the Steering Committee and be announced by IOC Secretariat to Member States at least 60 days in advance.
3. Disseminate the NWPTAC Enhanced Products exclusively to national authorities of user countries.
4. Disseminate the experimental NWPTAC Enhanced Products only by email.
5. Revise the Area of Service of NWPTA as shown in Appendix III.

Appendix I Comments on the PacWave16 Post-exercise Evaluation Form and Answers to the comments

Appendix II Forecast Points for the experimental NWPTAC Enhanced Products

Appendix III Plan of NWPTA's Area of Service (AoS) revision

Comments on the PacWave16 Post-exercise Evaluation Form and Answers to the comments

Country	Comments	Answers
Hong Kong, China	It would be better if regional map showing coasts of South China Sea could be introduced.	The purpose of the regional map is to grasp overall risks caused by the generated tsunami, and users are not recommended to focus on detailed mesh data. Considering this point, the current draft map would satisfy the purpose.
Hong Kong, China	If possible, Keyhole Markup Language (KML) file could be provided for displaying relevant tsunami information on Google Earth, Maps or other geospatial software.	According to the results of PacWave13 and PacWave15, KMZ files does not rank high in usefulness among PTWC new products. Considering these results, currently NWPTAC does not have a plan to add KML/KMZ files to NWPTAC Enhanced Products.
Malaysia	Some of the manuals were too large and have some trouble downloading.	I am not sure what this refers to. The exercise manual and Tsunami Service Provider's text/graphical products are not large. We will review the web sites and for files larger than 5MB, try to provide a slim version.
Papua New Guinea	Southern half of PNG not included. Need complete info for all of PNG. Forecast points to include Misima, Alotau, Port Moresby, Lae - others? <i>(Similar comments were shown in several other parts)</i>	Requested areas and forecast points will be included.
Russian Federation	Add an item Bering Island for calculating the time lag and wave height forecast. Nikolskoye (Bering isl) 55.120N 165.590E.	Requested point will be included as a forecast point.
Solomon Islands	The Eastern Parts and Southern Parts of Solomon Islands is not fully covered. Not whole area of Solomon Islands. <i>(Similar comments were shown in several other parts)</i>	Requested areas will be included.
Solomon Islands	Does not really indicated when is the next bulletin issuing time.	Bulletins will be issued when there is any change in situation. It is difficult to indicate the outlook on the next bulletin issuance.
Solomon Islands	The last question is marked yes/no. The reason being if relevant materials are provided training is done for national EOC & SIMS, then no need for international experts to come and conduct stakeholders training. If yes, then international experts can provide support to the local team.	Training materials will be prepared by NWPTAC, and provided to recipient member states.

Country	Comments	Answers
Solomon Island	One of our major gaps will be in an event when the telecom/internet service providers are shut down. This will affect receiving and disseminating of warnings, ie PTWC to SIMS/NDMO, and SIMS/NDMO to the public. Therefore, EMWIN system must be considered as a backup.	EMWIN is operated by U.S., and currently JMA has no plan to introduce satellite communication system for overseas countries for emergency. Currently three communication channels, i.e., email, FAX and GTS, are available to ensure receipt.
Solomon Islands	It could have been better if an exercise team which did not consist of NDMO/SIMS be running the exercise. Preferably PTWC/UNESCO to consider a regional team in this will allow NDMO/SIMS officers not to engage in running the exercise, but involve as participants in the exercise.	Every country is welcome to invite outside assistance to either run or observe the exercise. However, I am afraid that IOC/UNESCO/PTWC/ITIC would not have funding to provide such services.

Forecast Points for the experimental NWPTAC Enhanced Products

Note: Shaded cells represent modifications from current FPs.

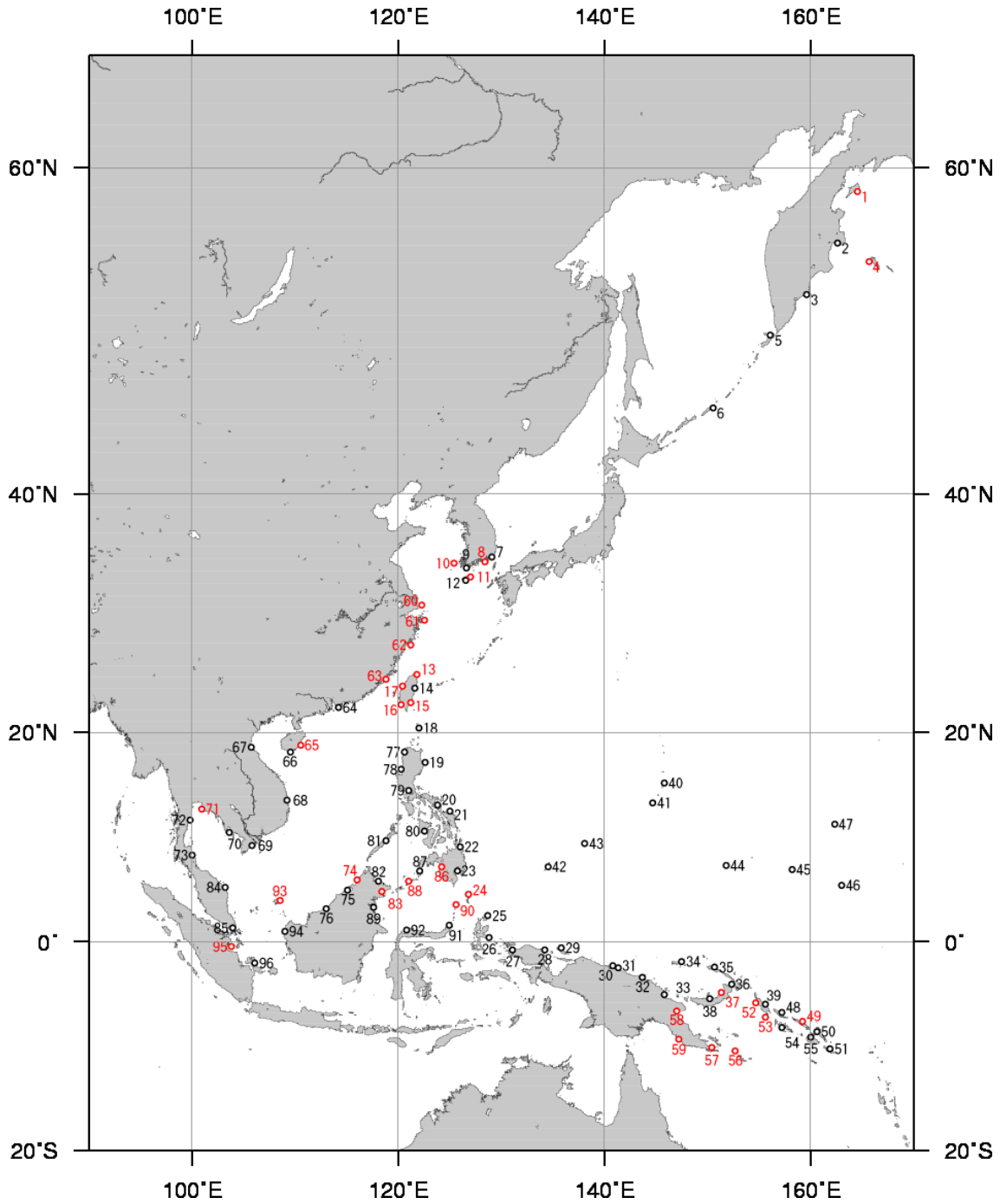
Coastal Block	Forecast Point	Latitude	Longitude	FP Number
EAST COASTS OF KAMCHATKA PENINSULA	OSTROV_KARAGINSKIY	58.8N	164.5E	1
	UST_KAMCHATSK	56.1N	162.6E	2
	PETROPAVLOVSK_K	53.2N	159.6E	3
	NIKOLSKOYA	55.1N	165.7E	4
KURIL ISLANDS	SEVERO_KURILSK	50.8N	156.1E	5
	URUP_IS.	46.1N	150.5E	6
SOUTH COASTS OF KOREAN PENINSULA	BUSAN	35.1N	129.1E	7
	TONGYEONG	34.7N	128.4E	8
	NOHWA	34.2N	126.6E	9
	HEUKSANDO	34.6N	125.4E	10
	CHEJU_ISLAND	33.5N	127.0E	11
	SEOGWIPO	33.2N	126.5E	12
TAIWAN	CHILUNG	25.2N	121.8E	13
	HUALIEN	24.0N	121.6E	14
	TAITUNG	22.7N	121.2E	15
	KAOHSIUNG	22.5N	120.3E	16
	HOMEL	24.2N	120.4E	17
EAST COASTS OF PHILIPPINES	BASCO	20.4N	122.0E	18
	PALANAN	17.2N	122.6E	19
	LEGASPI	13.2N	123.8E	20
	LAOANG	12.6N	125.0E	21
	MADRID	09.2N	126.0E	22
	DAVAO	06.9N	125.7E	23
NORTH COASTS OF IRIAN JAYA	GEME	04.6N	126.8E	24
	BEREBERE	02.5N	128.7E	25
	PATANI	00.4N	128.8E	26
	SORONG	00.8S	131.1E	27
	MANOKWARI	00.8S	134.2E	28
	WARSA	00.6S	135.8E	29
	JAYAPURA	02.4S	140.8E	30

Coastal Block	Forecast Point	Latitude	Longitude	FP Number
NORTH COASTS OF PAPUA NEW GUINEA	VANIMO	02.6S	141.3E	31
	WEWAK	03.5S	143.7E	32
	MADANG	05.2S	145.8E	33
	MANUS_IS.	02.0S	147.5E	34
	KAVIENG	02.5S	150.7E	35
	RABAU	04.2S	152.3E	36
	ULAMONA	05.0S	151.3E	37
	KIMBE	05.6S	150.2E	38
	KIETA	06.1S	155.6E	39
MARIANA ISLANDS	SAIPAN	15.3N	145.8E	40

	GUAM	13.4N	144.7E	41
PALAU	MALAKAL	07.3N	134.5E	42
MICRONESIA	YAP_IS.	09.5N	138.1E	43
	CHUUK_IS.	07.4N	151.8E	44
	POHNPEI_IS.	07.0N	158.2E	45
	KOSRAE_IS.	05.5N	163.0E	46
MARSHALL ISLANDS	ENIWETOK	11.4N	162.3E	47
NORTH COASTS OF SOLOMON ISLANDS	PANGGOE	06.9S	157.2E	48
	GHATERE	07.8S	159.2E	49
	AUKI	08.8S	160.6E	50
	KIRAKIRA	10.4S	161.9E	51
SOLOMON SEA	AMUN	06.0S	154.7E	52
	FALAMAE	07.4S	155.6E	53
	MUNDA	08.4S	157.2E	54
	HONIARA	09.3S	160.0E	55
	MISIMA	10.6S	152.7E	56
	ALOTAU	10.3S	150.4E	57
	LAE	06.8S	147.0E	58
CORAL SEA	PORT MORESBY	09.5S	147.2E	59
COASTS OF EAST CHINA SEA	SHANGHAI	31.2N	122.3E	60
	ZHOUSHAN	29.9N	122.5E	61
	WENZHOU	27.8N	121.2E	62

Coastal Block	Forecast Point	Latitude	Longitude	FP Number
COASTS OF SOUTH CHINA SEA	QUANZHOU	24.8N	118.8E	63
	HONG_KONG	22.3N	114.2E	64
	HAINAN_ISLAND	18.8N	110.5E	65
	SANYA	18.2N	109.5E	66
COASTS OF GULF OF TONKIN	VINH	18.6N	105.7E	67
EAST COASTS OF INDO CHINA PENINSULA	QUI_NHON	13.7N	109.2E	68
	BAC_LIEU	09.3N	105.8E	69
GULF OF THAILAND	SIHANOUKVILLE	10.6N	103.6E	70
	PATTAYA	12.8N	100.9E	71
	PRACHUAP_KHIRI_KHAN	11.8N	099.8E	72
	NAKHON_SI_THAMMARAT	08.4N	100.0E	73
NORTHWEST COASTS OF KALIMANTAN	KOTA_KINABALU	6.0N	116.0E	74
	MUARA	05.0N	115.1E	75
	BINTULU	03.2N	113.0E	76

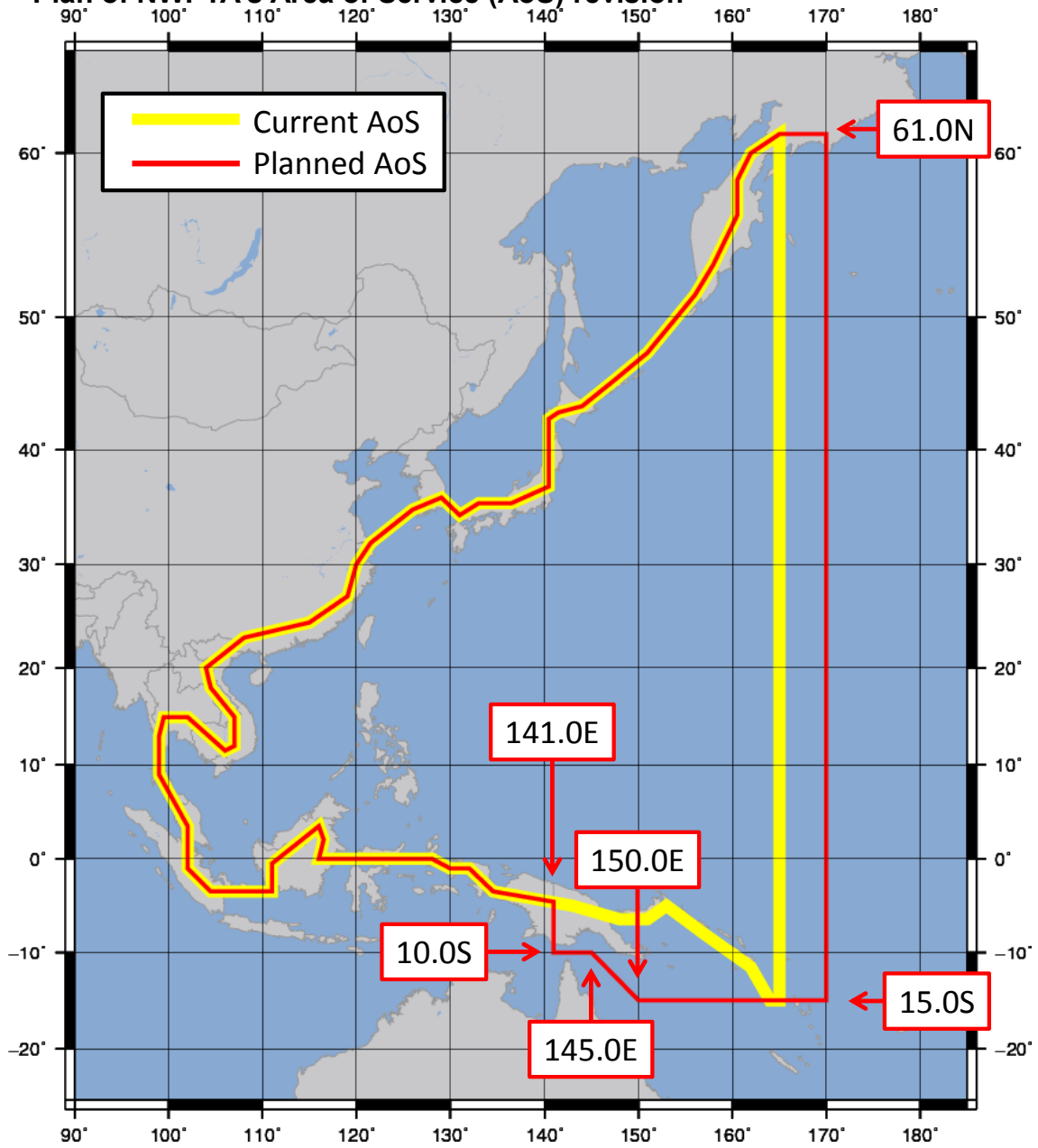
WEST COASTS OF PHILIPPINES	LAOAG	18.2N	120.6E	77
	SAN_FERNANDO	16.6N	120.3E	78
	MANILA	14.6N	121.0E	79
SULU SEA	ILOILO	10.7N	122.5E	80
	PUERTO_PRINCESA	09.8N	118.8E	81
	SANDAKAN	05.9N	118.1E	82
	LAHAD_DATU	04.9N	118.4E	83
EAST COASTS OF MALAY PENINSULA	KUALA_TERENGGANU	05.3N	103.2E	84
	SINGAPORE	01.3N	103.9E	85
CELEBES SEA	COTABUTO_CITY	07.3N	124.2E	86
	ZAMBOANGA	06.9N	122.1E	87
	MAIMBUNG	05.9N	121.0E	88
	TARAKAN	03.3N	117.6E	89
	TABUKAN_TENGAH	03.6N	125.6E	90
	MANADO	01.6N	124.9E	91
	TOLITOLI	01.1N	120.8E	92
NATUNA SEA	KEPULAUAN_RIAU	04.0N	108.5E	93
	SINGKAWANG	01.0N	109.0E	94
	KUALA_INDRAGIRI	00.5S	103.8E	95
	PANGKALPINANG	02.1S	106.1E	96



Forecast points (FPs) of the experimental
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Appendix III

Plan of NWPTA's Area of Service (AoS) revision



ANNEX V

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ANNEX VI

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AoS	Areas of Service
CATAC	Central America Tsunami Advisory Centre
CCO	Colombian Ocean Commission
CEA	Alternative Energies and Atomic Energy Commission
CEPREDENAC	Coordination Centre for the Prevention of Natural Disasters in Central America
CHS	Canadian Hydrographic Service
CMA	China Meteorological Administration
COPECO	Comisión Permanente de Emergencias
DFO	Department of Fisheries and Oceans
DMO	Disaster Management Office
EMBC	Emergency Management of the province of British Columbia
FDSN	Federation of Digital Seismograph Networks
FEMA	Federal Emergency Management Agency
GA	Geosciences Australia
GSC	Geological Survey of Canada
GSN	Global Seismographic Network
ICG/IOTWS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (
ICG/NEAMTWS	Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (),
ICG/PTWS	Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System ()
INETER	Instituto Nicaragüense de Estudios Territoriales
INOCAR	Joint Typhon Warning Center
IOC	Intergovernmental Oceanographic Commission

IOTIC	Indian Ocean Tsunami Information Center
IRIS	Incorporated Research Institutions for Seismology
ITIC	International Tsunami Information Center
ITP	International Training Programmes
ITST	International Tsunami Survey Team
ITU	International Telecommunication Union
IUGG	International Union of Geodesy and Geophysics
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JATWC	Joint Australian Tsunami Warning Centre
JICA	the Japan International Cooperation Agency
JMA	Japan Meteorological Agency
JST	Japan Science and Technology Agency
JTF	Joint Task Force
MRCC	Maritime Rescue Coordination Center
MTS	Medium-Term Strategy
NASA	National Aeronautics and Space Administration
NCEI	National Centers for Environmental Information
NDBC	National Data Buoy Centre
NEIC	National Earthquake Information Center
NGDC	NOAA National Geophysical Data Center
NIED	National Research Institute for Earth Science and Disaster Prevention
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
NTWC	National Tsunami Warning Centres
NWPTAC	Northwest Pacific Tsunami Advisory Center
NWS	National Weather Service
OFDA	Office of Foreign Disaster Assistance

ONEMI	Oficina Nacional de Emergencia del Ministerio del Interior y Seguridad Pública
ORSNET	Oceania Regional Seismic NETwork
PICs	Pacific Island countries
PMC	Pacific Meteorological Council
PMEL	NOAA Pacific Marine Environmental Laboratory
PTHA	Probabilistic Tsunami Hazard Assessment
PTWC	Pacific Tsunami Warning Center
SATREPS	Science and Technology Research Partnership for Sustainable Development
SCS	South China Sea
SCSTAC	South China Sea Tsunami Advisory Center
SMART	Science Monitoring And Reliable Telecommunication
SHOA	Servicio Hidrográfico y Oceanográfico de la Armada de Chile
SINAPRED	National System of Disaster Prevention (SINAPRED)
SINAPROC	Sistema Nacional de Protección Civil
SOP	Standard Operating Procedures
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
TNC	Tsunami National Contact
TOWS-WG	Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems
TSP	Tsunami Service Provider
TT	Task Team
TWFP	Tsunami Warning Focal Point
UNESCO	United Nations Educational, Scientific and Cultural Organization
US NTWC	National Tsunami Warning Center of United States
USAID	United States Agency for International Development
USGS	U.S. Geological Survey

VCP	Voluntary Cooperation Programme
WCDRR	World Conference on Disaster Risk reduction
WDS	World Data Service
WG	Working Group
WG-CA	Working Group for Central America
WG-SCS	Working Group for the South China Sea region
WMO	World Meteorological Organization

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27. Twelfth Session of the International Co-ordination Group for the Tsunami Warning System in the Pacific, Novosibirski, 1989	E, F, S, R
28. Third Session of the Sub-Commission for the Caribbean and Adjacent Regions, Caracas, 1989	E, S
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54. Second Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms, Paris, 1993	E, F, S
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56. First Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Melbourne, 1994	E, F, S, R
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65.	Second Planning Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1995	E only
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69.	Fourth Session of the IOC Regional Committee for the Central Eastern Atlantic, Las Palmas, 1995	E, F, S
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74.	Nineteenth Session of the Assembly, Paris, 1997	E, F, S, R
75.	Third Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 1997	E, F, S, R
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94.	Fifth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2001	E, F, S, R
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99.	Fifth Session of the IOC Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean, Kenya, 2002 (* Executive Summary available separately in E, F, S & R)	E*
100.	Sixth Session of the IOC Intergovernmental Panel on Harmful Algal Blooms, St. Petersburg (USA), 2002 (* Executive Summary available separately in E, F, S & R)	E*
101.	Seventeenth Session of the IOC Committee on International Oceanographic Data and Information Exchange, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
102.	Sixth Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2003 (* Executive Summary available separately in E, F, S & R)	E*
103.	Nineteenth Session of the International Coordination Group for the Tsunami Warning System in the Pacific, Wellington, New Zealand, 2003 (* Executive Summary available separately in E, F, S & R)	E*
104.	Third Session of the IOC Regional Committee for the Central Indian Ocean, Tehran, Islamic Republic of Iran, 21-23 February 2000	E only
105.	Thirty-seventh Session of the Executive Council, Paris, 2004	E, F, S, R
106.	Seventh Session of the IOC-WMO-UNEP Committee for the Global Ocean Observing System, Paris, 2005 (* Executive Summary available separately in E, F, S & R); and Extraordinary Session, Paris, 20 June 2005	E*
107.	First Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Perth, Australia, 3-5 August 2005	E only
108.	Twentieth Session of the Intergovernmental Coordination Group for the Tsunami Warning System in the Pacific, Viña del Mar, Chile, 3-7 October 2005 (* Executive Summary available separately in E, F, S & R)	E*
109.	Twenty-Third Session of the Assembly, Paris, 21-30 June 2005	E, F, S, R
110.	First Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS), Rome, Italy, 21-22 November 2005	E only
111.	Eighth Session of the IOC Sub-commission for the Caribbean and Adjacent Regions (IOCARIBE), Recife, Brazil, 14-17 April 2004 (* Executive Summary available separately in E, F, S & R)	E*
112.	First Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions (ICG/CARIBE-EWS), Bridgetown, Barbados, 10-12 January 2006	E only
113.	Ninth Session of the IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE), Cartagena de Indias, Colombia, 19-22 April 2006 (* Executive Summary available separately in E, F, S & R)	E S*

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

151.	Twenty-fourth Session of the Intergovernmental Coordination Group for the Pacific Tsunami Warning and Mitigation System, Beijing, China, 24–27 May 2011 (*Executive Summary in E, F, S & R included)	E*
152.	Twenty-first Session of the IOC Committee on International Oceanographic Data and Information Exchange, Liège, Belgium, 23–26 March 2011 (*Executive Summary available separately in E, F, S & R)	E*
153.	Eighth Session of the IOC Sub-Commission for the Western Pacific (WESTPAC-VIII), Bali, Indonesia, 10–13 May 2010 (*Executive Summary available separately in E, F, S & R)	E*
154.	Tenth IOC Intergovernmental Panel on Harmful Algal Blooms, Paris, France, 12–14 April 2011 (* Executive Summary available separately in E, F, S & R)	E*
155.	Forty-fifth Session of the Executive Council, Paris, 26–28 June 2012 (* Decisions available in E, F, S & R)	E*
156.	Seventh Session of the Intergovernmental Coordination Group for the Tsunami and other Coastal Hazards Warning System for the Caribbean Sea and Adjacent Regions, Willemstad, Curacao, 2–4 April 2012 (*Executive Summary available in E, F, S & R)	E*
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164.	Eleventh Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North Eastern Atlantic, the Mediterranean and Connected Seas, 12–14 November 2014, Nicosia, Cyprus (*Executive Summary available in E, F, S & R)	E*
165.	Twenty-sixth Session of the Intergovernmental Coordination Group for the for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVI), Hawaii, USA, 22–24 April 2015 (*Executive Summary available in E, F, S & R)	E*
166.	Tenth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE-EWS), Philipsburg, Sint Maarten, Kingdom of the Netherlands, 19–21 May 2015 (*Executive Summary available in E, F, S & R)	E*
167.	Tenth Session of the IOC Sub-Commission of the Western Pacific (WESTPAC-X), Phuket, Thailand, 12–15 May 2015	E
168.	Twenty-eighth Session of the Assembly, Paris, 18–25 June 2015	
169.	Twelfth 12th Session of the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS-XII), Dublin, Ireland, 16-18 November 2015 (*Executive Summary available in E, F, S & R)	E*
170.	Eleventh Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions (ICG/CARIBE EWS-XI), Cartagena, Colombia, 5-7 April 2016 (*Executive Summary available in E, F, S & R)	E*
171.	Tenth Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS), Muscat, Oman, 24–26 March 2015	E*
172.	Forty-ninth Session of the Executive Council, Paris, 7–10 June 2016 (* Decisions available in E, F, S & R)	E*
173.	Thirteenth Session of the Intergovernmental Coordination Group for the Tsunami and Other Coastal Hazards Warning System for the Caribbean and Adjacent Regions, Bucharest, Romania, 26–28 September 2016 (*Executive Summary available in E, F, S & R)	E*
174.	Twenty-seventh Session of the Intergovernmental Coordination Group for the for the Pacific Tsunami Warning and Mitigation System (ICG/PTWS-XXVII), Tahiti, France, 28-31 March 2017 (*Executive Summary available in E, F, S & R)	E*