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МЕЖПРАВИТЕЛЬСТВЕННАЯ ОКЕАНОГРАФИЧЕСКАЯ КОМИССИЯ (ЮНЕСКО)

Пятьдесят третья сессия Исполнительного совета
ЮНЕСКО, Париж, 29 июня – 3 июля 2020 г.

Пункт **3.1** предварительной повестки дня

Доклад Исполнительного секретаря МОК о работе, проделанной в период после 30-й сессии Ассамблеи

Резюме

Вводная часть настоящего доклада содержит стратегический анализ текущего положения дел и работы, проведенной МОК в отчетный период. Кроме того, в нем дается краткая оценка выполнения программы и хода осуществления мероприятий в двухлетний период 2018-2019 гг. Оценка достигнутых результатов проводилась путем сопоставления с плановыми показателями эффективности и целевыми показателями.

В Добавлении к докладу (только на английском языке) содержится подробная актуализированная информация о работе, проделанной в период после 30-й сессии Ассамблеи МОК (июнь 2019 г. – май 2020 г.), в разбивке по функциональным задачам.

Настоящий доклад, а также «Доклад об исполнении бюджета в 2018-2019 гг. и общей структуре бюджета на 2020 г.» (IOC/EC-53/3.1.Doc(2)) представляют собой рабочие документы, дополняющие устное выступление Исполнительного секретаря на пленарном заседании Исполнительного совета.

Предлагаемое решение: Исполнительному совету предлагается принять настоящий доклад к сведению и рассмотреть проект решения, упомянутого в предварительном документе о принятых и предлагаемых мерах (документ IOC/EC-53/AP) как Реш. IOC/EC-53/3.1.

ВСТУПИТЕЛЬНОЕ ЗАМЕЧАНИЕ ИСПОЛНИТЕЛЬНОГО СЕКРЕТАРЯ МОК

1. В начале 2020 г., года 60-летия МОК, Комиссия активно занималась подготовкой плана проведения Десятилетия ООН, посвященного науке об океане в интересах устойчивого развития (2021-2030 гг.) (далее «Десятилетие»). С 16 марта 2020 г. в связи с объявлением о пандемии коронавирусной инфекции Covid-19 Секретариат перешел на работу в дистанционном режиме и проведение совещаний в формате телеконференций. Многие важные мероприятия и совещания, в том числе Конференция ООН по океану 2020 г. и 26-я Конференция сторон РКИКООН, были отменены или перенесены на более поздние сроки. На более поздние сроки было перенесено и проведение 209-й сессии Исполнительного совета ЮНЕСКО. 3 апреля 2020 г. Председатель МОК направил государствам-членам циркулярное письмо № 2799 с предложением отложить проведение 53-й сессии Исполнительного совета МОК.

2. Коронавирусная инфекция уже привела к драматичным последствиям по всему миру и угрожает жизни и здоровью значительной части населения планеты. В связи с этим я хотел бы поблагодарить Секретариат МОК за то, что в сложных условиях пандемии и связанного с ней стресса его сотрудники продолжают активно, профессионально и вдохновенно выполнять свои обязанности.

3. Дальнейшие возможные направления работы, касающиеся морских научно-исследовательских программ и океанографических наблюдений, а также деятельности МОК в целом теперь необходимо рассматривать с позиции, в которой наш мир окажется после завершения нынешнего кризиса. Еще в марте 2020 г. стало понятно, что пандемия скажется на океанографических наблюдениях и деятельности научно-исследовательского флота. Для обеспечения возможности отслеживания на ежедневной основе последствий пандемии Центр СКОММ по поддержке программы наблюдений *in situ* (СКОММОПС) и Глобальная система наблюдений за океаном (ГСНО) скорректировали методы своей работы. В целях оказания структурам, эксплуатирующим развернутое в море измерительное оборудование, и содействия в минимизации негативных последствий его блокировки в настоящее время рассматривается вопрос о создании информационной платформы, которая поможет координировать взаимодействие в этих вопросах. В районах, где объявлен карантин, были отменены учения по проверке готовности к цунами. Тем не менее, в марте 2020 г. прошло несколько успешных оповещений о потенциально разрушительных цунами. Запланировано проведение оценки воздействия пандемии с точки зрения эффективности систем предупреждения о цунами и обеспечения готовности к ним, а также на предмет финансирования морских научно-исследовательских программ.

4. Сегодня коронавирус оказался в числе основных стоящих перед человечеством глобальных проблем. С точки зрения экологии пандемия может иметь краткосрочное положительное воздействие. Замедление антропогенной деятельности в период пандемии приведет к сокращению выбросов CO_2, CH_4, N_2O и других загрязнителей антропогенного происхождения. Уже имеется информация о снижении уровня подводного шума. В некоторых прибрежных районах было отмечено улучшение качества морской воды. В краткосрочной перспективе могут отмечаться и другие проявления снижения нагрузки на окружающую среду. Вместе с тем негативное воздействие пандемии на состояние здоровья человека, масштабы нищеты и безработицы и ряд других социальных последствий приведут к новой, менее предсказуемой ситуации в отношении возобновления человечеством хозяйственной деятельности, связанной с океаном. После завершения пандемии океан сохранит свою важнейшую функцию одной из основных систем жизнеобеспечения на планете. МОК необходимо будет продолжить крайне важную работу по реализации своих основных программ, предпринять дополнительные шаги в свете предстоящего проведения Десятилетия, предложить свой экспертный опыт и знания по связанным с океаном вопросам, а также по вопросам изменения климата и морского биоразнообразия. Кроме того, МОК необходимо будет тщательно проанализировать возможности и способы своего участия в решении широкого спектра вопросов, касающихся взаимосвязи между океаном и здоровьем человека, в том числе предоставления океанографических данных для проведения медицинских научных исследований.

5. В добавлении к настоящему документу подробно представлены основные результаты деятельности МОК в рамках всех шести ее функциональных задач, сформулированных в *Среднесрочной стратегии на 2014-2021 гг.* (IOC/INF-1314). Указанная деятельность осуществлялась в стабильном режиме. Положительная динамика была отмечена по всем направлениям работы. Перечислю здесь лишь некоторые наиболее значимые мероприятия и достижения: разработка стратегии ГСНО на период до 2030 г. («Стратегия ГСНО-2030»), проведение конференции по океанографическим наблюдениям «OceanObs'19», успехи в разработке системы управления данными и информацией на базе платформ «ОДИСКат» и «Инфохаб-Океан», постоянное пополнение баз данных Системы биогеографической информации об океане (ОБИС), успехи в деле координации исследований по океаническому углероду, близящаяся к завершению работа над вторым Глобальным докладом о состоянии океанографии (ГДСО), прогресс в работе, связанной с проблематикой закисления океана, вредоносным цветением водорослей и анализом долговременных рядов данных, активизация деятельности по обеспечению готовности к цунами и отбору новых провайдеров услуг по цунами, участие в подготовке *специального доклада МГЭИК по теме «Океаны и криосфера в условиях изменения климата»*, существенный прогресс в деле практического взаимодействия с местными органами и учреждениями в вопросах морского пространственного планирования и подготовка к реализации нового этапа проекта «Глобальная академия "Океан-инструктор"». В регионах проводилась работа по максимальному задействованию огромных возможностей, которые открываются в свете Десятилетия перед всеми государствами-членами, в первую очередь странами Африки, НРС и МОСРГ, в соответствии с обязательством «никого не оставить без внимания». В этом отношении важнейшую роль продолжают играть региональные вспомогательные органы МОК.

6. 19 марта 2020 г. государствам-членам и вспомогательным органам МОК для экспертной оценки было направлено циркулярное письмо МОК № 2798 с первоначальным проектом плана проведения Десятилетия. Данный проект был также представлен более чем 500 участникам двух специальных глобальных вебинаров. Сегодня стало понятно, что пандемия может отразиться на процедуре рассмотрения указанного плана как в рамках, так и вне МОК, в том числе на возможных вариантах его представления Генеральной Ассамблее ООН на ее 75-й сессии. Проведение Десятилетия, таким образом, начнется в новых глобальных экономических условиях. Эти новые реалии, возможно, потребуют учета на заключительных этапах планирования программы Десятилетия.

7. Многие мероприятия МОК станут непосредственным вкладом в проведение Десятилетия. Как активнейший участник подготовительной фазы МОК готова и дальше выступать в роли учреждения-координатора Десятилетия, проведение которого обеспечит выход морской науки на новый уровень и повысит ее способность содействовать устойчивому развитию. Это потребует не только повышения потенциала в области морской научно-исследовательской деятельности, но и усовершенствования методов руководства на этом направлении, а также укрепления авторитета МОК и ее способности принимать решения и действовать в интересах всей системы Организации Объединенных Наций. Данное Десятилетие будет проводиться в увязке с проведением других провозглашенных недавно ООН и запланированных на тот же период десятилетий, в частности связанных с восстановлением экосистем и достижением целей в области устойчивого развития.

8. Наряду с этим направленность мероприятий ЮНЕСКО будут задавать два рамочных документа, касающихся роли океана в климатических процессах: РКИКООН и разрабатываемый на базе Конвенции ООН по морскому праву (ЮНКЛОС) международный юридически обязательный документ о сохранении и устойчивом использовании морского биологического разнообразия за пределами действия национальной юрисдикции (БПНЮ). В соответствии с решениями, принятыми в ходе КС-25 (декабрь 2019 г., Мадрид), ожидается, что МОК окажет поддержку в рассмотрении данного вопроса в рамках Климатической конвенции через свой Вспомогательный орган для консультирования по научным и техническим аспектам. Деятельность МОК в области океанографических наблюдений, сбора данных, проведения совместных исследований состояния морской среды, создания потенциала и подготовки кадров может

стать важнейшим вкладом в разработку правового документа по БПНЮ. Этот вклад будет востребован как на уровне Организации Объединенных Наций, так и отдельных государств, при этом формальную роль МОК в разработке указанного международного юридически обязательного документа еще предстоит определить.

9. Весьма существенный объем работы Секретариата МОК в межсессионный период был связан с вопросами разработки программ, планирования расходов, мониторинга и отчетности, участием в подготовке 40-й сессии Генеральной конференции ЮНЕСКО и очередных сессий ее Исполнительного совета. Значительные усилия были также направлены на поддержание сотрудничества с учреждениями системы ООН, в частности со Всемирной метеорологической организацией (ВМО), в условиях существенной корректировки структуры Секретариата последней, что было обусловлено продолжением реформы входящих в ее состав органов. Существенному пересмотру подверглись методы управления и секретариатской поддержки таких международных программ, как Всемирная программа исследования климата (ВПИК) и Глобальная система наблюдения за климатом (ГСНК). МОК намерена продолжить взаимодействие с ВМО, в том числе в рамках Объединенного совета по сотрудничеству ВМО-МОК.

10. Руководящее участие МОК в процессе подготовки Десятилетия, вклад ее основных программ в решение широкого спектра связанных с океаном вопросов, касающихся устойчивого развития и организации управления на международном уровне, выполнение обязательств по оказанию экспертной поддержки в реализации морских научных программ ряду сетевых структур высокого уровня, таких как Группа высокого уровня по вопросам экологичного морского хозяйствования, а также повышение эффективности информационного сопровождения указанной деятельности и популяризация ее целей способствовали еще большему признанию достигнутых МОК результатов.

11. Мы крайне признательны многим государствам-членам за их последовательную и щедрую поддержку. Бельгия (Фландрия), Канада, Республика Корея, Соединенное Королевство, Швеция и Япония оказали финансовую помощь в подготовке плана проведения Десятилетия. Норвегия продолжала оставаться основным донором нецелевых средств по линии специального счета МОК, обеспечивших осуществление мероприятий на основе в первую очередь коллективно согласованных приоритетов. Бельгия (Фландрия), Китай и Австралия продолжали оказывать поддержку основным бюро МОК и их программам соответственно в Остенде, регионе ВЕСТПАК и в Перте. Кроме того, Бельгия (Фландрия) возобновила поддержку по линии Целевого фонда ЮНЕСКО/Фландрии по поддержке мероприятий ЮНЕСКО в области естественных наук (ФЮСТ) и утвердила предложения по трем представленным МОК крупным проектам, которые будут осуществлены в 2020-2022 гг.

12. Вместе с тем осуществление программ МОК по-прежнему носит в значительной степени неустойчивый характер, что обусловлено хронической нехваткой кадровых и финансовых ресурсов. Указанные вопросы будут обсуждаться Исполнительным советом при рассмотрении им пунктов повестки дня, касающихся программы и бюджета, что призвано улучшить понимание в отношении объема средств, необходимых МОК для поддержки усилий по обеспечению устойчивого и основанного на научном подходе освоения ресурсов Мирового океана.

13. Тридцатая сессия Ассамблеи МОК (2019 г.) придала мощный импульс усилиям Секретариата Комиссии, направленным на дальнейшее весьма эффективное оказание услуг государства-членам. Хотел бы поблагодарить Председателя МОК г-на Ариэля Троиси и всех должностных лиц МОК за эффективное руководство работой Секретариата на основе профессионального подхода и приверженности общему делу. Предыдущий Председатель МОК продолжает консультировать нас по стратегически значимым вопросам. Хочу также поблагодарить все государства-члены за оказанное Секретариату МОК доверие. Их неизменная поддержка является источником подлинного энтузиазма в нашем движении «на пути к океану, необходимому для будущего, к которому мы стремимся».

ОБЩАЯ СТРАТЕГИЧЕСКАЯ ОЦЕНКА РАБОТЫ В 2018-2019 гг.

[выдержка из документа 209 EX/4.I.A) Выполнение программы, утвержденной Генеральной конференцией, Часть I: Доклад о выполнении программы (ДВП) (в период с 1 января 2018 г. по 31 декабря 2019 г.): Межправительственная океанографическая комиссия]

Основные достижения

123. В двухлетнем периоде 2018-2019 гг. основная деятельность Комиссии была сосредоточена на подготовке плана проведения Десятилетия Организации Объединенных Наций, посвященного науке об океане в интересах устойчивого развития (2021-2030 гг.). МОК сделала все возможное для привлечения всех государств-членов, партнеров из системы ООН и ключевых заинтересованных сторон, представляющих гражданское общество, к участию в региональных и глобальных консультациях, стремясь не упустить уникальную возможность использовать достижения в области наук об океане для обеспечения лучшего понимания системы океана и выработки научно обоснованных решений в целях осуществления Повестки-2030. Эффективное использование механизма консультаций в рамках структуры «ООН-океаны» способствовало укреплению взаимодействия в интересах конструктивного распределения обязанностей между партнерами МОК по системе Организации Объединенных Наций. Возможность использования в следующем двухлетнем периоде неизрасходованного остатка средств по документу 38 C/5 также имела крайне важное значение для организации консультаций и в целом для укрепления руководящей роли МОК в общих процессах принятия решений и осуществления мероприятий в рамках подготовки Десятилетия. Постепенно была сформирована весьма перспективная концепция, основанная на целом ряде инициативных революционных изменений в области океанических наблюдений, науки об океане и соответствующих услугах, сопровождающихся их масштабным применением во всех видах деятельности, связанной с растущим, но устойчивым использованием морского пространства и ресурсов. Значительный прогресс достигнут в разработке методологии оказания государствам-членам поддержки в выполнении курируемых МОК задач 14.3.1 и 14.a ЦУР и представлении соответствующей отчетности.

124. Руководство МОК принимало активное участие в процессе переговоров по международному юридически обязывающему документу о сохранении и устойчивом использовании морского биологического разнообразия в районах за пределами действия национальной юрисдикции. Учитывая новые возможности, открывающиеся в связи с проведением Десятилетия ООН, МОК обладает необходимым потенциалом для поддержки будущего соглашения, особенно в том, что касается развития потенциала и передачи морской технологии, в целях обеспечения универсального характера этого документа и его соответствия потребностям всех его будущих сторон, в частности развивающихся стран.

125. Число профилей, измеренных с помощью сети буев Арго, достигло в ноябре 2018 г. двух миллионов, что свидетельствует об обеспечении государствами-членами стабильного функционирования Глобальной системы наблюдений за океаном (ГСНО), а также о необходимости постоянной координации и информационно-разъяснительной работы в отношении этой системы под руководством МОК. Сети буев Арго развернули 26 государств-членов. Кроме того, более 70 государств-членов вносят активный вклад в ГСНО в рамках одной из ее сетей наблюдений или региональных альянсов ГСНО. Конференция по океаническим наблюдениям, прошедшая 16-20 сентября 2019 г., стала важной вехой в дальнейшем развитии ГСНО.

126. К настоящему времени 137 государств-членов, в том числе 33 МОСРГ и девять стран Африки, создали национальные координационные центры по предупреждению о цунами/национальные центры предупреждения о цунами. В результате продолжавшейся более чем четыре года при координации со стороны МОК совместной работы международных партнеров в регионе Южно-Китайского моря был открыт собственный консультативный центр по цунами, выполняющий роль системы предупреждения о цунами для девяти стран региона. В

настоящее время в трех регионах (Карибский бассейн, Тихий океан и Индийский океан) в экспериментальном порядке осуществляется основанная на показателях эффективности программа по сертификации готовности к цунами на уровне общин. В рамках этой программы к концу 2019 г. сертификаты получили более 20 общин в 15 странах, соответствующие установленным критериям. Более 26 государств-членов из числа МОСРГ применяют экосистемный подход к управлению трансграничными живыми морскими ресурсами.

127. МОК продолжала уделять особое внимание развитию потенциала своих государств-членов, в частности в рамках своих региональных вспомогательных органов – ВЕСТПАК, МОКАРИБ, МОКАФРИКА и ИОСИНДИО. В Африке при координации со стороны Центра МОК по развитию потенциала в Остенде (Бельгия) три центра Глобальной академии МОК «Океан-инструктор» организовали курсы подготовки по морским наукам, которые проходили на французском языке в Сенегале, на английском в Кении и на португальском в Мозамбике. В рамках второй Международной экспедиции в Индийском океане более 50 ученых из африканских стран приняли участие в исследовательских экспедициях, организованных Южной Африкой. Представители Кении, Коморских Островов, Маврикия, Мадагаскара, Мозамбика, Объединенной Республики Танзания и Южной Африки прошли подготовку по составлению карт вызываемых цунами наводнений и карт эвакуации при цунами. Представители Кении, Коморских Островов, Мадагаскара, Танзании и Южной Африки отработали стандартные оперативные процедуры (СОП) предупреждения о цунами и экстренного реагирования. Все имеющие выход к Индийскому океану африканские государства-члены приняли участие в учениях «Волна-18», а в Кении, Танзании и на Сейшельских Островах была проведена эвакуация населения.

128. Десятилетие ООН открывает для Африки колоссальные возможности. МОК совместно со странами центральноафриканской подгруппы разрабатывает проект, направленный на снижение степени уязвимости прибрежных районов и адаптацию к изменению климата, а также на содействие участию этих стран в развитии сотрудничества по линии Юг-Юг в Южной Атлантике. МОК приступила к подготовке крупной конференции по науке об океане в поддержку устойчивого развития Африки, которая запланирована в октябре 2020 г. в Шарм-эш-Шейхе (Египет).

129. План проведения Десятилетия способствует обеспечению синергетического взаимодействия в работе по ЦУР 5 и ЦУР 14 благодаря акценту на роли женщин в океанографии, совершенствовании глобальных знаний об океане и содействии принятию обоснованных и инклюзивных решений. Глобальный доклад о состоянии океанографии, в котором приводятся данные с разбивкой по полу, будет и далее служить одним из механизмов мониторинга прогресса.

130. Особое внимание уделялось МОСРГ, а также взаимодействию с молодежью и разъяснению ценности знаний коренных народов. В июле 2019 г. в Нумеа была организована консультация с МОСРГ южной части Тихого океана. Консультации для МОСРГ Карибского бассейна и западной части Индийского океана планируется провести в Мексике и Кении соответственно. С учетом успешного опыта проведения в мае 2019 г. в Копенгагене первого Совещания по глобальному планированию, к участию в каждой региональной консультации привлекаются молодые специалисты в области наук об океане.

Межсекторальное сотрудничество: достижения и проблемы

131. При поддержке со стороны правительства Швеции МОК создала платформу для повышения уровня грамотности в связанных с океаном вопросах и подготовила комплект материалов, который на экспериментальной основе используется в школах 36 стран в рамках сети САШ. В сотрудничестве с международной научной группой по инициативе «голубой углерод» МОК разработала методологию количественной оценки запасов «голубого» углерода в целях оказания поддержки в подготовке национальных докладов для РКИКООН и содействовала участию Организации в КС-24 и КС-25 посредством повышения осведомленности о роли оке-

ана в регулировании изменения климата. Десятилетие ООН предоставит возможности и рамочную основу для активизации существующих и развития новых синергетических связей с использованием подхода, предполагающего взаимодействие с другими секторами.

Привлечение средств и установление партнерских связей

132. В период 2018-2019 гг. Межправительственная океанографическая комиссия привлекла 9,4 млн. долл.

133. Обменявшись с участниками прошедшей в ноябре 2018 г. в Найроби Конференции по устойчивой «голубой» экономике опытом оказания государствам поддержки в области морского пространственного планирования, МОК расширила свои партнерские связи с Европейской комиссией, выступив с новой совместной инициативой, направленной на содействие трансграничному морскому пространственному планированию.

134. Бельгия (Фландрия), Канада, Республика Корея, Соединенное Королевство, Швеция и Япония оказали финансовую помощь в подготовке плана проведения Десятилетия. Норвегия по-прежнему оставалась основным донором нецелевых средств для специального счета МОК, содействуя осуществлению программы при особом внимании к коллективно согласованным приоритетам. Бельгия (Фландрия), Китай и Австралия продолжали оказывать поддержку основным бюро МОК и их программам в Остенде, регионе ВЕСТПАК и Перте соответственно.

135. Развивается ряд перспективных партнерств с частным сектором, в том числе на основе сотрудничества с созданной в рамках Глобального договора ООН Платформой действий в поддержку устойчивого освоения океана. МОК установила партнерские связи с фондом Velux в целях налаживания сотрудничества с благотворительными организациями в рамках мероприятия по привлечению партнеров, которое состоится в феврале 2020 г. в Королевской академии наук и литературы Дании. В качестве вклада в работу конференции «Наш океан» (23-24 октября 2019 г., Осло, Норвегия) МОК объявила о создании Альянса в поддержку проведения Десятилетия Организации Объединенных Наций, посвященного науке об океане в интересах устойчивого развития (2021-2030 гг.). Альянс будет формироваться в преддверии второй Конференции Организации Объединенных Наций по океану (2-6 июня 2020 г., Лиссабон, Португалия), на которой он будет официально представлен в качестве глобальной коалиции занимающихся вопросами океана партнеров, сотрудничающих в целях поддержки и активизации подготовки Десятилетия, а также привлечения соответствующих обязательств.

Основные проблемы, возникшие при выполнении программы, и корректирующие меры

136. В целом наиболее сложная задача, стоящая перед немногочисленным секретариатом Комиссии, состоит в выполнении двойной функции, заключающейся в привлечении средств, необходимых для сохранения ее основных оперативных программ, и выполнении руководящей и координирующей роли на этапе подготовки Десятилетия. В настоящее время разрабатывается новый подход к привлечению средств и информационно-разъяснительной деятельности, основанный на освещении общественно значимых результатов работы МОК и демонстрации отдачи от инвестиций в океанографию и наблюдения за океаном.

137. В области коммуникации и информационно-разъяснительной деятельности ведется более активная работа по популяризации целей Десятилетия и привлечению более широкого круга заинтересованных сторон. В качестве одного из самых недавних примеров такой работы можно привести параллельное мероприятие высокого уровня, организованное в ходе 40-й сессии Генеральной конференции ЮНЕСКО при поддержке со стороны Кении и Португалии. В этом мероприятии приняли участие руководство ЮНЕСКО, министр морского хозяйства Португалии, секретарь кабинета министров по вопросам образования Кении, специаль-

ный посланник Генерального секретаря ООН по океану, научные эксперты и заинтересованные представители сообщества мореплавателей, а также начинающие ученые из МОСРГ, обменявшиеся своими выводами относительно важных вопросов второй Конференции ООН по океану (Лиссабон, Португалия, 2-6 июня 2020 г.) и предстоящего Десятилетия Организации Объединенных Наций, посвященного науке об океане в интересах устойчивого развития (2021-2030 гг.).

КРАТКАЯ ИНФОРМАЦИЯ ОБ ОЦЕНКЕ ПРОГРЕССА В РАМКАХ ОЖИДАЕМОГО РЕЗУЛЬТАТА

Главное направление деятельности 1: Содействие развитию знаний и потенциала в целях охраны океанов и прибрежных районов и устойчивого управления ими

Ожидаемый результат 1 для МОК: Разработка и осуществление государствами-членами научно обоснованной политики, направленной на сокращение уязвимости к связанным с океаном бедствиям, глобальное сохранение океана, морей и морских ресурсов и устойчивое управление ими и на повышение устойчивости и адаптацию к изменению климата в интересах осуществления Повестки-2030

Комплексный бюджет 39 C/5 (в тыс. долл.)					
Бюджет мероприятий обычной программы (2018-2019 гг.)			**Добровольные взносы 2018-2019 гг.**		
План расходов в объеме 518 млн. долл. с учетом корректировок	Расходы		Утвержденный бюджет 39 C/5	Расходы	Средства, привлеченные в 2018-2019 гг.
2 775	2 771		17 576	13 773	9 066

Общая оценка прогресса в достижении ожидаемого результата: 🟢

🟥: работа не соответствует плану; 📐: работа частично идет по плану; 🟢: работа идет по плану

Показатели эффективности (ПЭ) и контрольные показатели (КП)	**Оценка прогресса в достижении контрольного показателя по состоянию на 31.12.2019 г.**
ПЭ: Число получивших поддержку государств-членов, которые провели отвечающие современным требованиям океанические исследования в целях решения конкретных проблем, связанных с океаном и антропогенным воздействием на прибрежные районы **КП:** (i) 52 государства-члена, в том числе 7 стран Африки и 7 МОСРГ (ii) 91 государство-член, в том числе 24 страны Африки и 13 МОСРГ (iii) 80 государств-членов, в том числе 8 стран Африки и 4 МОСРГ	(i) 30 государств-членов, в том числе 13 развивающихся стран, 1 МОСРГ, 1 страна Африки (27% женщин) (контрольный показатель был пересмотрен в связи с реформированием структуры ВПИК и состава рабочих групп) (ii) 96 государств-членов, в том числе 23 страны Африки и 17 МОСРГ (iii) 80 государств-членов, в том числе 8 стран Африки и 2 МОСРГ
ПЭ: Число получивших поддержку государств-членов, поддерживающих, расширяющих и внедряющих глобальные системы данных и информации по наблюдениям за океаном в целях использования их материалов и сокращения уязвимости к связанным с океаном рискам **КП:** (i) 60 государств-членов, в том числе 5 стран Африки и 8 МОСРГ (ii) 13 государств-членов, в том числе 5 стран Африки и 1 МОСРГ (iii) 20 государств-членов	(i) 66 государств-членов, в том числе 11 стран Африки и 8 МОСРГ (ii) 13 государств-членов, в том числе 5 стран Африки и 1 МОСРГ (iii) 20 государств-членов (iv) 96 государств-членов (в том числе 18 стран Африки) создали НЦОД или ассоциированные структуры по обмену данными; созданы 5 ассоциированных структур по обмену информацией (в том числе в 1 стране Африки)

Показатели эффективности (ПЭ) и контрольные показатели (КП)	Оценка прогресса в достижении контрольного показателя по состоянию на 31.12.2019 г.
(iv) 90 государств-членов, в том числе 22 страны Африки	
ПЭ: Число получивших поддержку государств-членов, создавших системы раннего предупреждения и обеспечения готовности для смягчения опасности цунами и других связанных с океаном стихийных бедствий в целях повышения устойчивости **КП:** (i) 75 государств-членов, в том числе 15 МОСРГ и 6 стран Африки (ii) 9 государств-членов, в том числе 5 МОСРГ (iii) 5 государств-членов, в том числе 1 МОСРГ (iv) 13 государств-членов, в том числе 2 страны Африки и 2 МОСРГ (v) 45 государств-членов, в том числе 6 стран Африки и 5 МОСРГ	(i) 137 государств-членов, в том числе 28 МОСРГ и 9 стран Африки (ii) 15 государств-членов, в том числе 5 МОСРГ (iii) 13 государств-членов, в том числе 7 МОСРГ (iv) 10 государств-членов, в том числе 2 страны Африки (v) 45 государств-членов, в том числе 6 стран Африки и 5 МОСРГ
ПЭ: Число получивших поддержку государств-членов, имеющих механизмы взаимодействия науки об океане и политики в поддержку здоровых океанических экосистем в соответствии с Повесткой-2030 **КП:** (i) 12 государств-членов (ii) 25 государств-членов, в том числе 5 МОСРГ и 5 стран Африки (iii) 45 государств-членов, в том числе 6 стран Африки (iv) 35 государств-членов, в том числе 5 МОСРГ и 7 стран Африки (v) 9 государств-членов, в том числе 5 стран Африки и 1 МОСРГ	(i) 30 государств-членов вносят вклад в подготовку продуктов ГЕБКО (ii) 72 государства-члена внесли в реестр экспертов по оценке состояния Мирового океана 680 экспертов, в том числе 21 из стран Африки и 5 из МОСРГ (iii) 21 государство-член (в том числе 1 страна Африки) работает с наборами данных по закислению океана (iv) 15 государств-членов участвуют в научных программах и программах развития потенциала в области оценки и регулирования концентрации питательных веществ (v) 6 государств-членов организовали региональные семинары по вопросам уязвимости прибрежных районов с целью разработки регионального проекта по адаптации к изменению климата В ходе посвященного Десятилетию ООН семинара в регионе Южной Атлантики также рассматривались региональные приоритеты в области адаптации в прибрежных районах.
ПЭ: Число получивших поддержку государств-членов, использующих принципы научно обоснованного управления экосистемами и измеряющих прогресс в достижении ЦУР 14 **КП:** (i) 88 государств-членов, в том числе 13 стран Африки и 10 МОСРГ (ii) 45 государств-членов, в том числе 6 стран Африки и 5 МОСРГ	(i) 106 государств-членов, в том числе 28 стран Африки и 8 МОСРГ (ii) эксперты/представители 48 государств-членов, в том числе 8 стран Африки и 3 МОСРГ, приняли участие в международном форуме и учебных мероприятиях по МПП и используют свои знания для разработки национальных планов в области МПП

Показатели эффективности (ПЭ) и контрольные показатели (КП)	Оценка прогресса в достижении контрольного показателя по состоянию на 31.12.2019 г.
(iii) 13 государств-членов, в том числе 4 МОСРГ	(iii) 10 государств-членов, в том числе 3 МОСРГ, приняли участие в информационно-разъяснительной деятельности ООН в рамках параллельных мероприятий Совещания по вопросам биологического разнообразия в районах за пределами действия национальной юрисдикции, конференции «Наш океан» и РКИКООН
ПЭ: Число получивших поддержку государств-членов, обладающих институциональным потенциалом и использующих его для достижения целей высокого уровня МОК **КП:** (i) 10 государств-членов, в том числе 1 страна Африки и 1 МОСРГ (ii) 60 государств-членов, в том числе 8 стран Африки и 8 МОСРГ, включая сбор кадровой информации в разбивке по полу в 45 государствах-членах (iii) (a) принятие планов развития потенциала и начало работы по ним с минимальным начальным финансированием. Финансирование дальнейшей деятельности – из внебюджетных источников (b) 120 специалистов, в том числе 20 из стран Африки и 5 из МОСРГ (iv) 100 специалистов, в том числе 30 из стран Африки и 0 из МОСРГ, включая гендерный контрольный показатель – 40% женщин (создание 5 региональных центров подготовки)	(i) 49 государств-членов приняли участие в исследовании, посвященном оценке потребностей, в том числе 12 стран Африки и 11 МОСРГ (ii) 45 государств-членов, в том числе 2 МОСРГ и 11 стран Африки (iii) (a) государства-члены региональных вспомогательных органов МОК приняли планы работы по развитию потенциала и приступили к их выполнению (b) 120 специалистов, в том числе 20 из стран Африки и 5 из МОСРГ (iv) см. пункт (iii) (b), помимо этого 149 человек прошли обучение в рамках 7 организованных в региональных центрах подготовки Глобальной академии «Океан-инструктор» курсов по темам, связанным с МПП/МПР, в том числе 35 человек из стран Африки.

Проблемы и риски в процессе осуществления и корректирующие меры

Основные проблемы	Корректирующие меры
Подготовка к проведению Десятилетия ООН существенно увеличивает объем работы секретариата, что отражается на его способности достигать результатов по основным программам. Необходимо создать постоянную и укомплектованную надлежащим персоналом координационную группу в целях обеспечения соответствия масштабным целям Десятилетия и поддержки работы по ним на протяжении следующих десяти лет. Возможно, необходимо также пересмотреть роль МОК в контексте ЮНКЛОС и переговоров по вопросам биологического разнообразия в районах за пределами действия национальной юрисдикции, что может еще больше усугубить ситуацию.	В настоящее время проводится кампания по привлечению средств, призванная стимулировать дополнительные внебюджетные инвестиции в связанную с Десятилетием деятельность. В 2020 г. будет создан альянс в поддержку Десятилетия в целях привлечения новых доноров. Требуется проведение дальнейших дискуссий в рамках ЮНЕСКО для выявления возможностей финансирования за счет средств обычной программы, которое могло бы способствовать удовлетворению кадровых потребностей координационной группы по проведению Десятилетия.

Основные проблемы	Корректирующие меры
При осуществлении программы одна из задач была связана с обеспечением участия ученых из развивающихся стран во Всемирной программе исследований климата. Поставленная цель, хоть и реализуется частично, не может быть достигнута полностью ввиду масштабной реструктуризации программы по итогам ее независимого обзора, результатом которого стало значительное сокращение числа экспертов, занимающихся разработкой мероприятий в рамках ВПИК. Это, в свою очередь, оказало пропорциональное воздействие на уровень представленности экспертов из развивающихся стран.	МОК будет тесно сотрудничать с директором и секретариатом ВПИК в целях обеспечения более широкого участия ученых из развивающихся стран в проводимых ей мероприятиях.
Необходимо наладить ключевые партнерские связи, с тем чтобы ГСНО могла стать гибкой системой, участники которой обеспечивали бы ее устойчивость, поскольку наблюдения за океаном находятся в самом начале производственной цепочки, другими компонентами которой являются системы управления данными, анализа и прогнозирования, а также научная информация, имеющая важное значение для разработки политики, обеспечения личной безопасности и принятия решений.	Роль ВМО как одного из спонсоров имеет ключевое значение для эффективного предоставления услуг, связанных с климатом, и оперативного обслуживания. Эта функция ВМО будет укрепляться в процессе ее реформирования. Кроме того, Десятилетие, посвященное науке об океане, будет способствовать преобразованиям, в которые ГСНО намерена внести свой вклад, поставив своей главной задачей обеспечение более четкого соответствия деятельности по осуществлению программы поставленным целям.

Всеобъемлющая стратегия партнерства

138. Вклад ключевых партнеров имеет решающее значение для успешного выполнения Комиссией ее постоянно расширяющегося мандата. Эффективное и действенное разделение функций между партнерами структуры «ООН-океаны» приобретает особо важное значение в контексте подготовки к Десятилетию ООН. В рамках проведенных в течение этого двухлетнего периода глобальных и региональных консультаций тысячи представителей заинтересованных партнеров, таких как правительства, научно-техническое сообщество, деловые круги, гражданское общество и международные организации, внесли свой вклад в разработку научного плана действий для Десятилетия. Эффективное предоставление климатических услуг и оперативное обслуживание обеспечиваются в тесном сотрудничестве с ВМО, в том числе на основе совместного финансирования программ. Продолжается успешное сотрудничество с Глобальным экологическим фондом (ГЭФ), ПРООН и ЮНЕП. В частности, ГЭФ поручил МОК реализацию следующего этапа проекта по международным водам IW:Learn+ (2020-2023 гг.). С МАГАТЭ, ФАО и ВОЗ было заключено трехстороннее соглашение о борьбе с сигуатерой.

139. Укрепление потенциала и работа на местах осуществляются при содействии региональных вспомогательных органов МОК. В регионе ИОСИНДИО два центра категории 2, расположенные в Исламской Республике Иран и Индии, вносят ценный вклад в осуществление программ и обеспечивают заинтересованное участие региона в их реализации. Партнеры, представляющие гражданское общество, играют ключевую роль в повышении осведомленности о социально-экономической значимости океана и усилиях МОК, направленных на поддержку устойчивого развития океанической экономики, решение основных связанных с океаном проблем и использование предоставляемых им возможностей.

ADDENDUM

DETAILED REPORT ON THE WORK ACCOMPLISHED SINCE THE 30TH SESSION OF THE IOC ASSEMBLY BY IOC FUNCTIONS

(June 2019–May 2020)

FUNCTION A: OCEAN RESEARCH

Foster ocean research to strengthen knowledge of ocean and coastal processes and human impact upon them

Understanding climate change and its effects on the world ocean

1. In December 2019, the World Climate Research Programme (WCRP) celebrated its 40th anniversary. The Programme underpins the work of the Intergovernmental Panel on Climate Change (IPCC), which in turn supports decision-making by the UN Framework Convention on Climate Change (UNFCCC). IOC brings the oceanographic constituency to WCRP, as the ocean is an integral and central part of the climate system. IOC's co-sponsoring of WCRP, therefore, represents an example of climate change science in action, through a value-chain approach, going from research to decision-making; this is particularly relevant and timely in light of the generally rather alarming findings of the *IPCC Special Report on Ocean and the Cryosphere in a Changing Climate*. A new strategic plan for WCRP up to 2029 was developed, in alignment with the UN Decade of Ocean Science for Sustainable Development. As the current joint Memorandum of Understanding between the WCRP co-sponsors—IOC, the World Meteorological Organization and the International Science Council—dates 1993, and in light of the above-mentioned developments, the three co-sponsors are finalizing a new MoU for consideration by their respective governing bodies (in-person or through a dedicated circular letter) in 2020.

2. IOC continues to provide active support to Member States in developing capacity to act towards, and to report on, SDG Indicator 14.3.1, which focuses on ocean acidification (cf. Function D). In its capacity as custodian agency for the indicator, the Commission has successfully developed the SDG indicator methodology, which was formally endorsed by the IAEG-SDGs and has since been upgraded to Tier II. IOC continues to promote the application of the methodology to guide scientists and governments on how to carry out measurements following the best practices established by the ocean acidification community. This introduction to the methodology and associated training courses were achieved through dedicated activities in the Caribbean, the Middle East, East Africa and Asia, and by relying on the expertise and support of the Global Ocean Acidification Observing Network (GOA-ON), which counts more than 730 members from 100 countries, including 18 SIDS and 23 African countries. IOC continued to provide the function of the technical secretariat of the GOA-ON, together with the International Atomic Energy Agency (IAEA). The IOC Secretariat co-organized the "4th GOA-ON International Workshop" in Hangzhou, China, 12–14 April 2019. The Secretariat is actively involved in the organization of the "5th International Symposium on the Ocean in a High-CO2 World", originally scheduled to take place in September 2020. Capacity development tools being developed by IOC include a manual on the 14.3.1 methodology, an Ocean Teacher Global Academy (OTGA) online curriculum on ocean acidification and a dedicated online data portal to assist Member States in their annual reporting on the Target. The data portal, a tool for submission, collection, validation, storage and sharing of ocean acidification data and metadata submitted towards the Sustainable Development Goal 14.3.1 Indicator, has first been used for the global data collection in 2020, with the resulting data products submitted to the UN Indicator Report. IOC provided contributions to the sections on ocean acidification, deoxygenation and blue carbon to the WMO annual *Statement on the State of the Global Climate* in 2019, which was presented in its preliminary version to the 25th session of the Conference of the Parties (COP25) of the UNFCCC, as well as to the WMO report on *The Global Climate in 2015–2019*. This work will continue in the context of the IOC *State of the Ocean Report*, which is under development.

Integrated research for observing and predicting the role of the world ocean in climate mitigation: Ocean carbon sources and sinks

3. The IOC Executive Council at its 51st session (IOC/EC-LI/3) agreed to establish a new IOC working group focusing on Integrated ocean carbon research (IOCR) and encompassing expertise from IMBeR, SOLAS, IOCCP, WCRP/CLIVAR and GCP. A first meeting of the IOCR initiative took place on 28–30 October 2019 at the IOC premises in Paris.

4. Scientific knowledge of the role of the world ocean in the carbon cycle is central to achieving the objectives of the UN Framework Convention on Climate Change and its Paris Agreement. There is strong evidence of the critical contribution of the world ocean in absorbing human-induced CO_2 emissions since the beginning of the Industrial Revolution, i.e. around the mid of the 18th Century. It is not commonly known that, during this period, the ocean has evolved from a small source to a significant sink of carbon. This has altered the biogeochemical properties of the world ocean (for example, its acidity), which has an impact on life in the ocean, ecosystem functioning, and derived benefits for society.

5. The many gaps in knowledge on ocean and climate we still face, and the high degree of uncertainty related to our current knowledge, combined with the great sense of urgency to act, have prompted IOC Member States to convene the current main players in ocean carbon research and systematic observations[1] under the umbrella of the IOCR initiative. The goal of this initiative is to design an integrated research and observation agenda in the context of the UN Decade of Ocean Science for Sustainable Development and in support of relevant efforts by the UNFCCC and its SBSTA.

6. It is calculated that the world ocean absorbs approximately 26% of total anthropogenic emissions (Friedlingstein et al., 2019).[2] The future behaviour of the world ocean will depend on future emissions, and different scenarios can be formulated, including a reduced buffer capacity (IOCR comm.). The IOCR initiative has identified as preliminary priorities for research and observations of ocean carbon; these include: improving modelling capacities; integrative physico-chemical with biological approaches; connecting coastal and open ocean carbon processes; understanding the connectivity between the ocean carbon cycle and the cycles of oxygen and nutrients, as well as how multiple stressors affect ocean carbon dynamics; studying how the ocean biological pump responds to change (anthropogenic, variability) in the ocean; advancing scientific knowledge underpinning the debate on negative carbon emissions; advancing observations; pursuing a regional approach for ocean carbon research and observations to better inform mitigation efforts; and developing special focused efforts on polar regions in light of their central role as carbon sinks and their high vulnerability to climate change.

7. IOC co-organized and co-sponsored the International Blue Carbon Initiative (BCI) annual meeting in China in August 2018 and in September 2019 in Denmark. IOC further supported several side events during the UNFCCC COP24 and COP25 highlighting the potential of Blue Carbon Ecosystems as a nature-based solution to be applied in the NDCs to mitigate climate change.

8. IOC continues to co-sponsor GESAMP Working Group 41 on Geo-engineering in the Marine Environment, which provides for a continued interagency focus on the challenges and possibilities

[1] The IOC, the International Ocean Carbon Coordinating Project (IOCCP, which also operates as the Biogeochemistry Panel of the Global Ocean Observing System), the Surface Ocean-Lower Atmosphere Study (SOLAS), the Integrated Marine Biosphere Research Project (IMBeR), the Climate and Ocean Variability, Predictability and Change core project of the World Climate Research Programme (WCRP/CLIVAR), and the Global Carbon Project (GCP).

[2] Friedlingstein, P. et al. 2019. Global Carbon Budget 2019, *Earth Syst. Sci. Data*, *11*(4): 1783–1838, doi:10.5194/bg-14-3685-2017.

in marine geo engineering (also referred to as 'carbon dioxide removal and negative emissions techniques'). A summary of the outputs of the working group was published in *Nature* 570, June 2019, detailing the main messages GESAMP WG report produced in March 2019 and entitled *High Level Review of a Wide Range of Proposed Marine Geoengineering Techniques*. GESAMP WG41 is reconvening in 2020 with revised Terms of Reference with an enhanced focus on and wider societal implications of different marine geoengineering approaches on the marine environment. This will include the development of a holistic assessment framework that includes social, political, economic, ecological, ethical and other societal dimensions. IOC will facilitate the contribution of GESAMP WG41 to the work of the United Nations Framework Convention related to 'negative emissions' (carbon removal and other similar techniques) as part of the element on climate mitigation of the Convention's programme of work.

Ocean Research and the United Nations Framework Convention on Climate Change

9. In March 2020, the Secretariat of IOC presented its submission to the Ocean and Climate Change Dialogue to be convened by the Subsidiary Body for Scientific and Technological Advice of the United Nations Framework Convention on Climate Change, according to decision 1/CP.25 of the Conference of the Parties at its 25th session, held in Madrid in November–December 2019.

10. The Ocean and Climate Change Dialogue is to consider how to strengthen mitigation and adaptation in the context of the efforts by the Conference of the Parties to highlight the importance of the ocean, including as an integral part of the Earth's climate system, and to ensure the integrity of ocean and coastal ecosystems in the context of climate change. The Dialogue represents an opportunity to continue raising the profile of the world ocean in the context of policy negotiations and deliberations on climate change through a knowledge-driven, solution-orientated approach.

11. IOC's contribution informs how ocean research can contribute to relevant topics and workstreams under the Convention and its Paris Agreement. These topics and workstreams involve, but are not limited to, research, systematic observation, Global Stocktake and cooperation with the IPCC (Science), NDCs and the technical examination process on mitigation (Mitigation), the Nairobi Work Programme (Adaptation), LULUCF (Land Use, Land Use Change and Forestry – topic: Land Use), the Needs-based Finance Project (Climate Finance), multiple workstreams related to Climate Technology, Education, as well as technical work under relevant SDGs and related targets and indicators.

12. IOC has also prepared its contribution to the UNFCCC SBSTA Research Dialogue, which focuses on research and systematic observation (Article 5 of the Convention). The IOC report on the IOCR initiative containing a proposed Research and Observation Agenda 2030 will be presented at the next session of the Research Dialogue under the Convention (both the Ocean and Climate Change Dialogue and the Research Dialogue have been postponed from June to October 2020 in light of the current Covid-19 pandemic).

13. IOC also collaborates with UNFCCC and all relevant UN bodies throughout the remaining months of the preparation phase of the UN Decade of Ocean Science for Sustainable Development and into the implementation phase of the Decade. This collaboration will ensure that priority needs for knowledge generation, applications and services, and strengthening of the science-policy interface related to effective mitigation and adaptation, understanding of the importance of the ocean as an integral part of the Earth's climate system, and the integrity of ocean and coastal ecosystems in the context of climate change, are fully integrated into the proposed Decade's activities.

Research on multiple ocean stressors and their effects on the world ocean

14. As reflected in the IPCC *Special Report on Oceans and the Cryosphere in a Changing Climate*, de-oxygenation is an emerging problem exemplifying the effects of climate change-induced ocean warming, and also related to eutrophication along coastal areas. IOC leads scientific and capacity development efforts related to deoxygenation, for the benefit of its Member States, through its Working Group Global Ocean Oxygen Network (GO_2NE).

15. GO_2NE held a joint workshop with GlobalHAB in June 2019, which focused on the interaction of deoxygenation and harmful algae blooms. This workshop was followed by the "2019 GO_2NE meeting", which focused on the workplan for the upcoming two years, including the organization of the "first GO_2NE Summer School" in September 2019 and the development of the Ocean Oxygen Data Portal. The GO_2NE Summer School, held at the Xiamen University's Xiang'an Campus, which hosts the State Key Laboratory of Marine Environmental Science, was attended by 37 students from 19 countries, including participants from Africa. The IOC Secretariat contributed to the production and launching at the UNFCCC COP25 of a major book on ocean deoxygenation coordinated by IUCN. IOC co-organized with IOCCP a scoping meeting to discuss the features of and requirements on an ocean oxygen data portal on 11–12 November 2019 in Sopot, Poland, which saw the participation of more than 20 experts from 11 countries.

16. The IOC group of experts to study the effects of climate change on plankton communities (TrendsPO) continued the systematic compilation of phytoplankton time-series (data sets), related analyses, and a synthesis of the findings through a drafting workshop held in early 2020 and hosted by CSIRO, Australia. This work also informs modelling efforts under the WCRP.

17. The IOC Executive Council at its 51st session agreed to establish a new IOC working group focusing on multiple stressors. A draft scientific summary for policy-makers introducing the issue of multiple stressors on marine ecosystems—working title: *Ocean under Stress: A changing ocean at all locations*—was presented at the 30th Session of the IOC Assembly in June 2019 (IOC-XXX/3). In light of the Covid-19 pandemic, the first meeting of the IOC Working Group on Multiple Ocean Stressors took place on-line and refined further the Scientific Summary for Policy-makers. The WG will in its work assess and define experimental challenges related to multiple drivers experiments; identify links between physiological responses and ecosystem impacts; identify ecosystem-level reference points related to multiple stressors; develop indicators for systematic observations on multiple stressors; communicate arguments for the integration of the multi-stressor approach in ocean models and predictions and, finally, identify management requirements in relation to multi-stressor research. Elucidating further these issues will be fundamental to inform Ecosystem Based Management and dedicated research actions within the framework of the UN Decade of Ocean Science for Sustainable Development.

Research on upwelling systems

18. The Workshop on "The Canary Current Eastern Boundary Upwelling System (EBUS)" was held in Mindelo, Cabo Verde, on 10–12 March 2020 and was attended by 20 experts from Cabo Verde, Gambia, Guinea, Mauritania, Morocco, Senegal, France and Spain. A data archive compiling primary production data from the four main EBUS was produced and contains 164 measurements for the Canary Current, 54 for the Benguela Current, and 109 for the Humboldt Current, as well as reference to open access data for the California Current. A resource list of capacity development activities for the Canary Current region was produced, offering a total of 28 university programmes in 5 countries, as well as 9 international exchange programmes. IOC co-sponsored the ICTP-CLIVAR Summer School on Oceanic EBUS (13–17 July 2019, Trieste, Italy,).

19. The inherent variability of EBUS poses large challenges in projecting their responses to climate change and other ocean stressors. This has a direct impact on food security, livelihood systems of local populations, and economies. IOC has therefore launched a new project, funded by Spain,

on the status of knowledge of the main four EBUS and gaps to be filled through research and observations for the sustainable management of these systems and to enhance their contribution to the blue economy. The Global Environment Facility and FAO have been identified as strategic partners to this project and future efforts of IOC in this area.

The Second International Indian Ocean Expedition

20. The Second International Indian Ocean Expedition began its second 5-year phase (to 2025), as agreed by its three co-sponsors in 2019 (IOC/UNESCO, Scientific Committee on Oceanic Research and Indian Ocean Global Ocean Observing System). Its expanding activity and range of endorsed projects is contributing strongly to the IIOE-2 mission, aligning with both the IIOE-2's Science Plan and Implementation Strategy. The breadth and depth of high-quality science produced continues to significantly increase. It also continues to align with the mutual objectives of IIOE-2's three co-sponsors. See the updated (March 2020) *Second International Indian Ocean Expedition (2015-2025)* (IOC/BRO/2019/6Rev.) for reference. As has been customary since the IIOE-2's inception in 2015, it worked in integration with a number of other Indian Ocean science alliances across both the oceanic and climate research sphere, including: Indian Ocean Global Ocean Observing System (a GOOS Regional Alliance); Indian Ocean Region Panel of CLIVAR/IOC-GOOS; Sustained Indian Ocean Biogeochemistry and Ecosystem Research of IOGOOS/IMBeR; Indian Ocean Observing System Resources Forum of IOGOOS; and IOC Regional Committee for the Central Indian Ocean. Together, they have developed *IndOOS-2: A roadmap to sustained observations of the Indian Ocean for 2020-2030* (IOC/INF-1384).The IOC through its Perth Programme Office continued to play a major facilitating and coordinating role for IIOE-2, including through its hosting of the IOC IIOE-2 Coordinator and Australian Node of the IIOE-2 Joint Project Office (the other Node being based in Hyderabad, India, and supported by the Indian Government's Ministry of Earth Sciences). The IIOE-2 has engaged in various Indian Ocean related UN Decade planning meetings, aiming to ensure that the IIOE-2 is well positioned to make a tangible contribution to the Decade's implementation. The next annual major IIOE-2 Steering Committee meeting (generally comprising up to 100 participants) has been postponed due to the Covid-19 situation, and will remain in planning to be held back to back with the major International Indian Ocean Science Conference 2020, also postponed after having been slated for March 2020, Goa, India.

Key challenges encountered in implementation and remedial actions taken

Communicating ocean science

21. Communicating the findings of ocean science and how ocean science is conducted in various regions of the world may be difficult. Importantly, there is a need to illustrate the contribution of ocean science to tackling societal problems. To this end, the IOC Secretariat organized an Ocean Science Day, which was held on the margins of the 30th session of the IOC Assembly, in the morning of 27 June 2019. The half-day event was designed to be an informal exchange among ocean scientists, country representatives, engaged citizens and representatives from international organizations and the private sector, and offered an opportunity to discuss the contribution of ocean science to society in the next UN Decade. The event was open to the general public, beyond delegations of IOC Member States. Two panels focusing on the science aspect of the UN Decade of Ocean Science for Sustainable Development were organized: "Science Imperatives for the upcoming UN Decade" and "Science for Society". Member States and the general public attending Ocean Science Day appreciated, in particular, the opportunity to benefit from pedagogical presentations of complex issues related to ocean processes and the effects of human activities on these.

Structural limitations and solutions

22. Several Member States continue suffering from structural lack of capacities in research and systematic observations that hamper their application of standard operating procedures, as well as access to data. This challenge continues to be addressed by linking the activities contributing to

Function A with those of Function E, as far as efforts related to training and the transfer of knowledge and technology among Member States, through proactive provision of technical assistance by IOC. However, some Member States appear to face lingering structural challenges related to infrastructural and human capacity in the area of ocean science. In turn, the Ocean Science Section encounters challenges in implementing the ocean science portfolio of IOC at a level that would assist Member States in overcoming such limitations. This situation requires adequate, much more ambitious and sustained, funding from Member States to expand further the scale of the multiple ocean science actions pursued by the Commission.

FUNCTION B: OBSERVING SYSTEM/DATA MANAGEMENT
Maintain, strengthen and integrate global ocean observing, data and information systems

23. The main elements of Function B focus on sustained ocean observing and data management activities, encompassed in the Global Ocean Observing System (GOOS) and regional activities through GOOS Regional Alliances and the IOC Sub-Commissions, and the International Oceanographic Data and Information Exchange (IODE) and its regional activities. These programmes are focused on sustained observing activity and data delivery, with global networks and global approaches. They provide the basic infrastructure that enables a significant amount of oceanographic research, and the application of knowledge towards operational information services, and addressing challenges related to climate and the sustainability of marine ecosystem health.

The Global Ocean Observing System

24. Building on work developed by a Joint WMO-IOC Consultation Group on the reform of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), IOC Resolution XXX-2 (2019) decided to incorporate appropriate JCOMM functions and activities on observation and operational ocean forecasting systems into GOOS. The Observations Coordination Group—incorporating 12 major ocean observing networks, from the Voluntary Observing Ship marine meteorological network to Argo to animal-borne sensors, and including the work of the Joint WMO-IOC centre for oceanographic and marine meteorological observing programme support (JCOMMOPS)—and the Expert Team on Operational Ocean Forecasting Systems, focused on best practice and service delivery from ocean forecasting systems, are now incorporated into the work of the other GOOS components. The resolution also established the Joint WMO-IOC Collaborative Board as a high-level coordination mechanism with broader engagement of the key relevant bodies of the WMO and IOC. Through the disbanding JCOMM and the still-ongoing reform of WMO constituent bodies and secretariat, a need to create new functional connections between relevant IOC work such as GOOS (already joint) and IODE and their counterpart structures in WMO has emerged, and is a focus of GOOS bodies and the Joint Collaborative Board.

25. The *Global Ocean Observing System 2030 Strategy* (IOC/BRO/2019/5 rev.2) was approved by Assembly Decision IOC-XXX/7.1.1 (2019) and WMO Resolution 47 (Cg-18, 2019), as well as by representatives of the United Nations Environment Programme (UNEP) and the International Science Council (ISC)—all four co-sponsors of GOOS. It is available as GOOS Reports, 239 in English, French, Spanish, Chinese and Portuguese. It has an ambitious vision for a broad ocean observing community in all Member States, and a mission more focused on what the programme can deliver, consistent with the processes in the *Framework for Ocean Observing* and a clearer expression of the *value chain* from observations, through data management systems, into scientific assessments and ocean forecast systems, to service and information delivery, and finally into the hands of end-users that can use the information for individual or collective societal benefit.

26. A core Strategic Objective of the 2030 Strategy is to strengthen partnerships to improve delivery of forecasts, services, and scientific assessments. To that end, it has published a *Roadmap for the Implementation of the Global Ocean Observing System 2030 Strategy*, for an open planning process with partners. The Roadmap adds substance to the 11 Strategic Objectives of the 2030 Strategy, laying out the issues, implementation ideas, and highlighting how they will act together to guide development of an integrated system. Some of the Strategic Objectives encompass core

GOOS programme activities, and others will likely be led by partner organizations—achieving the strategy will require cooperation, coordination and the commitment of many organizations beyond the core of GOOS. It will also require a new system of governance for partnerships.

27. The IOC and GOOS were co-sponsors, along with dozens of other relevant organizations, of the "OceanObs'19 Conference" (16–20 September 2019, Honolulu, USA), the third decadal conference on global sustained ocean observations. OceanObs'99 (October 1999, Saint-Raphaël, France) helped launch a global sustained ocean observing system for climate, and OceanObs'09 (September 2009, Venice, Italy,) led to the creation of the Framework for Ocean Observing and the integration of biogeochemical and biological observations in GOOS. The OceanObs'19 Conference had the input of nearly 2,500 contributing authors for its Community White Papers, and nearly 1,500 attending in person. For GOOS, it was an important opportunity to listen to community discussions and identify priorities for the implementation of the *Global Ocean Observing System 2030 Strategy*. Some key themes emerged, including:

- Planning for impact: codesign of the observing system, end-to-end, with stakeholders and users.
- Core system integration: democratization of data, best practice, integration of biological and ecological observations, and a growing emphasis on the coast.
- Embracing innovation in technology and governance, and looking to the UN Decade of Ocean Science for Sustainable Development 2021–2030 as a vehicle for transformation.

28. At the "OceanObs'19 Conference", the indigenous peoples' perspective on ocean observing was a welcome new dimension. Indigenous communities from around the Pacific and beyond were represented and dialogued with the conference. Partnership with indigenous communities could come with expansion of global observing systems to some coastal areas, and perhaps also in lengthening the observational record for climate through traditional knowledge. A coastal indigenous people's declaration, the *Aha Honua*, is an important reflection on the consideration of indigenous communities as stakeholders with clear needs, and as partners for the observing community.

29. GOOS also engaged fully with the planning process of the UN Decade of Ocean Science for Sustainable Development 2021–2030, launching its *2030 Strategy* at the first global planning meeting (Copenhagen, Denmark, May 2019), and holding its ninth biennial "GOOS Regional Forum" immediately following the "UN Ocean Science Decade Regional Planning Workshop (RPW) for the North Pacific and Western Pacific Marginal Seas" (Tokyo, August 2019). It prepared an input for the Ocean Decade's Strategic Action Framework, identifying the close link between the implementation of the *2030 Strategy* and the objectives of the Ocean Decade. Transformative actions that build better partnerships for delivery and innovation actions that create a more responsive and sustained ocean observing system will both act as contributions to the Ocean Decade's transformative mission. For GOOS projects that might promise contributions to the Ocean Decade, through their transformative engagement of partners down the value chain, or through their innovation in techniques, GOOS will encourage them to take into the account the criteria for endorsement by the Ocean Decade.

30. Building on the 20-year history of work by the IOC to develop a cooperative framework regarding the sharing of ocean data in Exclusive Economic Zones (EEZs, IOC Resolutions XX-6 and EC-XLI.4, and IOC Decision EC-LI.4.8), focused on the Argo profiling float network; WMO Resolutions 45 and 46 (Cg-18, 2019) on ensuring adequate marine meteorological and oceanographic observations and data coverage for the safety of navigation and the protection of life and property in coastal and offshore areas, and future collaboration with IOC on facilitating oceanographic observations in coastal regions in support of earth system prediction and climate services; and a survey of GOOS observing network experience in performing Marine Scientific Research in EEZs. GOOS held an experts' workshop on ocean observations in areas under national jurisdiction (12–13 February 2020, UNESCO, Paris, France) to highlight potential concerns and potential solutions spaces to facilitate the taking of sustained ocean observations in EEZs, and to suggest areas of work on defining or demonstrating the value and impact of the needed observations. The report of the meeting (GOOS

Reports, 246) is intended to assist Member States to come to consensus on a process for wide and open-ended dialogue on the solution spaces that might benefit from collective action through the IOC.

31. The *Ocean Observing System Report Card 2019* reports on the status of global ocean observing networks, and highlighted ocean acidification, scientific collaboration and partnership in support of sustained ocean observations in GOOS, as well as challenges and issues. It highlights that 86 countries are involved in ocean observations, measuring 18 ocean and 9 atmospheric Essential Ocean or Essential Climate Variables. Nearly 9,000 *in situ* observing platforms report, enabling thousands of scientific papers and hundreds of thousands of weather forecasts that have assimilated *in situ* ocean observations.

32. In the space of monitoring of ocean ecosystem health, the GOOS Biology and Ecosystems Panel was funded by Future Earth to identify the existing monitoring backbone for each biological and ecological Essential Ocean Variable, identify the extensions needed for these backbones in the next 10 years, and to define the attributes of biological observing networks within a global system. This project built a database of this monitoring backbone, with the goal of building up to regular reporting on the state of the observing system. The most pressing priorities to build a global monitoring system are to establish the leadership and partnerships that will agree on best practices and data architecture, plan their implementation, and communicate them broadly.

33. The Covid-19 pandemic and the related restrictions on human movement have had impact on both the GOOS programme and the ocean observing system. The immediate impact on the real-time flow of ocean observations in the first months of global restrictions (March and April 2020) has been limited, with a 15% drop in observations reported from commercial vessels, and a 5% drop in observations from surface ocean drifters measuring temperature, ocean currents, and in many cases atmospheric pressure. The supply of ocean data for weather and ocean forecasting systems and early warnings of hazards can continue to operate normally, however airborne observations have been very critically reduced. However, the ability of ocean observing implementers to work is severely limited during this pandemic, creating future risks of gaps and holes in ocean observations. Research vessels have in large part been called back to port, and it is impossible to travel. The autonomous platforms measuring the ocean degrade, and need regular maintenance and redeployment which is now being cancelled or postponed. Batteries will run down, and instruments and data will be lost. The risk becomes greater with longer periods of confinement.

34. GOOS has surveyed anticipated impacts and risks of the Covid-19 pandemic, and early results are: we predict gaps in observations and anticipate a strong risk of capital losses from lost instruments that break free or stop communicating. Shore-based ecosystem surveys are largely on hold at the moment. We will lose continuity of data from critical climate records because it is impossible to go back in time to measure again. GOOS anticipates repeating surveys on impact as the pandemic evolves through 2020, to better understand the risks as they evolve. We will communicate on the impacts, the risks, and the response amongst ocean observing networks, amongst Member States, and with our users. We hope to share best practice in recovery operations, and to create a platform to learn, share, and to develop partnerships and joint work to recover and redeploy our ocean observing instruments.

35. The “Nineth meeting of the GOOS Steering Committee”, originally planned 22–24 April 2020 in Zanzibar, Tanzania, was transformed into an online session covering parts of the agenda. It addressed developing partnerships for delivery, working on coastal integration across GOOS, best practice on evaluation and review of observing systems, and improving the fitness for purpose of GOOS components. A planned regional workshop for Africa had to be postponed, with some online activity to move forward an agenda for Africa—but will be a priority when physical meetings are possible again.

Regional activity

36. At the “Ninth GOOS Regional Alliances (GRA) Forum (GRF-IX)” (Tokyo, 5–7 August 2019), GRAs reported on their progress and challenges in the last two years. The Integrated Marine Observing System (IMOS) and the North-East Asian Regional GOOS (NEAR-GOOS), for example, reported on key achievements on improving the sampling of data and the development of new databases. IMOS is improving its capacity on event-based sampling by focusing on marine heatwaves using ocean gliders. NEAR-GOOS has developed a Regional Real-Time and Delayed Mode Data Base. Black SEA GOOS and IOCARIBE-GOOS reported on successes on improving ocean monitoring. EuroGOOS and the US Integrated Ocean Observing System (IOOS) reported on successes on improving communication and partnership, and Southeast Asian Global Ocean Observing System (SEAGOOS) (WESTPAC) and Pacific Islands Global Ocean Observing System (PI-GOOS) reported on successes on capacity development. The Forum discussed and agreed on new GRA priorities and actions centered on: supporting the co-designing of the GOOS implementation plan, GRAs engagement and advocacy on ocean observation, and their contribution at the UN Ocean Science Decade regional planning workshop. The new GRA priorities and actions focus as well on supporting the strengthening and revitalizing of GRAs, in Africa. R.Venkatesan from Indian Ocean Global Ocean Observing System (IOGOOS), India, was endorsed as the new GRA Regional Council chairperson succeeding Glenn Nolan from EuroGOOS for the next two years.

37. IOCARIBE-GOOS participated actively in cross-GRA activities. IOCARIBE continues active work in developing a partnership to improve predictive skill of the Loop Current in the Gulf of Mexico. As part of a wider Caribbean project to improve hurricane observing and forecasting, on 15 August 2019 for the first time, an underwater glider was launched off the coast in Dominican Republic waters. This effort was led by the US NOAA and its Atlantic Oceanographic and Meteorological Laboratory (AOML), and the US Integrated Ocean Observing System (IOOS) working jointly with the Dominican Republic National Authority of Marine Affairs (ANAMAR), the National Office for Meteorology (ONAMET) and the Dominican Republic Navy.

38. IOCARIBE Member States recommended to expand implementation of the Coastal Inundation Forecasting Demonstration Project for the Caribbean (CIFDP-C) to other IOCARIBE countries starting with Curacao, Costa Rica and Honduras. Presently, the CIFDP design and implementation plan for Curacao is being developed in cooperation with the Curacao Meteorological Department.

39. IOCARIBE, IOCARIBE-GOOS, GEO Blue Planet and other partners are continuing their efforts to develop an operational region-wide information and forecasting system for sargassum and oil spills, and to develop a guide on best management practices for sargassum events in the coastal environment. IOCARIBE is also engaging in the development of an All-Atlantic Ocean Observing System emerging as a legacy of the AtlantOS project. In preparation of the UN Decade of Ocean Science for Sustainable Development and to address the sargassum issue, France, in cooperation with IOC of UNESCO, hosted the 1st “International Conference on Sargassum”, 23–26 October 2019, Guadeloupe. The Conference brought together Caribbean Heads of State and multilateral organizations, thus providing an opportunity to define a common geopolitical strategy to manage the sargassum impact in the region. The conference’s main objectives were to: (i) include the issue of sargassum on the international political agenda; (ii) mobilise international means to stem the harmful effects of the massive stranding of sargassum; (iii) strengthen collaboration between actors in the Caribbean; and (iv) create a network of technical and scientific experts on the Sargassum problem at a Caribbean scale. The 1st International Conference on Sargassum Joint Declaration refers to Recommendation SC-IOCARIBE-XV.9 on Sargassum, and stresses the need for coordination with IOC and IOCARIBE, and to continue the efforts to include the Sargassum research as an initiative in the UN Decade.

40. An important initiative aligned to the Second International Indian Ocean Expedition (IIOE-2: 2015–2025, IOC/BRO/2029/6REV.) and undertaken in close liaison with IIOE-2 constituents was the comprehensive ‘Decadal Review’ of the Indian Ocean Observing System (IndOOS), being a major basin scale element of wider GOOS. (see the Roadmap to sustained observations of the Indian Ocean for 2020–2030 (IndOOS-2). In respect to facilitating improved ocean observations and end to

end elements relating to observations (including data and information management, process characterisation, modelling, capacity development), the IndOOS Forum was re-energised and plans are in place for it to enhance its support for GOOS in the Indian Ocean.

41. Many IIOE-2 constituents also engaged in UN Decade discussions and events to contribute to the Decade's planning phase, seeking to identify and help plan for IIOE-2 (and IndOOS) to make a tangible contribution to the Decade during its implementation phase, including contributing the ocean observational aspirations of the Decade. The IIOE-2 Steering Committee was supposed to meet for its fourth annual meeting during March 2020, back to back with the "International Indian Ocean Science Conference 2020", in Goa, India, in conjunction and integrated with a number of complementary alliances that focus on ocean/climate, biogeochemistry and ecosystems and operational resources support. The March 2020 meetings were postponed due to the Covid-19 situation, with rescheduling yet to be confirmed.

42. IOCAFRICA has engaged with the Marine and Coastal initiative of the African Union Commission's programme on Global Monitoring for Environment and Security Africa (GMES and Africa). A joint workshop on operational oceanography, also intended to contribute to the reactivation of GOOS-Africa, was held on 16–18 December 2019 in Abidjan, Côte d'Ivoire. The participants welcomed and fully supported the initial collaboration between GOOS-Africa and GMES & Africa and strongly recommended the reinforcement of partnership through joint projects and activities, allowing Africa to harness the benefits of blue economy initiatives on the continent. Endogenous capacity development is a crosscutting challenge that should be integrated in every project.

43. The following project concepts were suggested for further development: (i) institutional and human capacity building; (ii) mentorship programmes in earth observations with a particular focus on open ocean, coastal and large inland lake observations, sciences and services; (iii) development of networks for special groups such emerging researchers and women in ocean science; (iv) organization of Pan-Africa Conferences on topics such as Operational Oceanography, Ocean Science for Sustainable Development and Ocean Science leadership; and (v) development of flagship projects on ocean observations for blue economy and mapping of coastal vulnerability to harness the full potential of the Blue Economy in Africa.

Data management

44. In order to enhance the role of marine information management, IODE at its 25th session adopted the concept of "IODE Associate Information Units" (AIUs), and an application form and associated review criteria are now available. By the end of 2019, five marine libraries have joined the IODE network as AIU. At the end of 2019, the IODE network comprised 9 accredited National Oceanographic Data Centres (NODCs), 1 accredited Associate Data Unit (ADU), 67 NODCs, 29 ADUs and 5 AIUs.

45. IODE is continuing and further developing its collaboration with, and support to, other IOC programmes and activities, including the GOSR, HAB, and SDG Indicator 14.3.1[3]; as well as more broadly the implementation of the *IOC Capacity Development Strategy* through its OceanTeacher Global Academy (OTGA) project in which all IOC programmes have been invited to participate as from 2019/2020 when Phase II of OTGA will commence (see also Function F).

46. As a follow-up to the endorsement of the ODIS Concept, Implementation Plan and Cost Benefit Analysis by the 30th session of the IOC Assembly, work has progressed on a fully detailed and costed project proposal for the IOC Ocean Data and Information System (ODIS). In addition, the inter-sessional working group started its work with a view to propose a strategy on ocean data and information stewardship for the UN ocean decade (IWG-SODIS).

[3] Average marine acidity (pH) measured at agreed suite of representative sampling stations.

47. In February 2019, the ODIS Catalogue of Sources (http://catalogue.odis.org) was launched and was demonstrated as a side event prior to the 30th session of the IOC Assembly. It aims to be an online browsable and searchable catalogue of existing ocean related web-based sources/systems of data and information as well as products and services. ODISCat will also provide information on products and visualize the landscape (entities and their connections) of ocean data and information sources. By March 2020, the catalogue included nearly 700 descriptions of on-line content sources covering 16 content types.

48. As an IODE contribution to the UN Ocean Decade, the IODE Secretariat has invited members of the UN Oceans task group (ESCAP, FAO, ISA, UNDP, UNEP, UNEP-Grid, UNFCCC, WCMC, WMO) to contribute descriptions of their online ocean-related data and information products and services to ODISCat. This will be a first step towards a UN-wide mapping of such sources and towards sharing the UN Decade-relevant data and information across the UN family.

49. As a further step in the development of ODIS and taking into account the important role of data and information in the proposed Clearing-House mechanism for the Transfer of Marine Technology, a workshop was held at UNESCO Headquarters (5–8 August 2019) to draft a comprehensive proposal entitled *The IOC Ocean InfoHub: development of an IOC CHM/TMT powered by a proof-of-concept ODIS architecture*.

50. The Ocean InfoHub Project will: (i) establish and anchor a network of regional and thematic nodes that will contribute to the transfer of marine technology (TMT) by enhancing shared scientific and technical capacities to render a wide range of data and information products and services; (ii) develop a proof-of-concept for an underlying Ocean Data and Information System (ODIS) architecture to enable scalable development of the global Ocean InfoHub and interoperability with local, regional and thematic data and information infrastructures; (iii) promote and foster awareness and collaboration with established organizations and systems providing enabling support to the marine community, connecting contributors and users with the resources to support their efforts. The project will create an ecosystem wherein stakeholders can provide, discover and use diverse content and services in a coherent and easily implementable manner.

51. The project will thus promote closer interaction across regions and themes, leading to improved mutual understanding and collaboration as well as to strengthening of inter-, multi- and transdisciplinary science, technology and innovation systems and policies. The proof-of-concept for an underlying Ocean Data and Information System reference architecture (ODIS-Arch: ODIS proof-of-concept reference architecture) will be applicable for the UN Decade of Ocean Science for Sustainable Development. It will build the foundations for a totally new IOC Ocean Data and Information System (ODIS). The proposal was successfully submitted for funding to the FUST (Flanders UNESCO Science Trust Fund) and has started in April 2020.

52. In 2017 the IODE agreed to join with the EU AtlantOS Project/ODIP/OceanObsRCN Best Practices Working Group to work towards an enhanced, permanent and sustainable repository of global best practices utilizing the already existing IODE OceanDataPractices repository. The name was changed to OceanBestPractices to reflect the 'all ocean-related' best practices broader remit. With its partners, the IODE OceanBestPractices Repository was further developed and in 2019 the Ocean Best Practices System (OBPS) was approved as a UNESCO/Intergovernmental Oceanographic Commission (IOC) Project established through Decision IOC-XXX/7.2.1 (IOC Committee on International Oceanographic Data and Information Exchange) adopted at the 30th Session of the IOC Assembly (June–July 2019) and jointly supported by the IODE and GOOS Programmes. A Steering Group of international experts was established. They met for the first time in December 2019 to guide OBPS development.

53. The IOC Ocean Best Practices System (OBPS, oceanbestpractices.org) supports the creation, publishing, discovery and access (FAIR Principles) to ocean related methods, best practices and standards. It includes: (i) the permanent repository, hosted by IODE, enhanced with natural-

language processing capabilities, coupled with semantic interoperability solutions and metadata indexing. At present it provides open access to 970 methodologies (March 2020); (ii) a peer review journal publishing outlet Frontiers in Marine Science RT: Best Practices in Ocean Observing; (iii) a strong community engagement strategy; and (iv) a training resource leveraging community capability organized through the OceanTeacher Global Academy and other training organizations. Together, these capacities are improving the discoverability and quality of ocean methods and best practices and will, eventually, link them to the data and information they generate.

54. The diversity within the ocean community and the continuous and asynchronous evolution of technology and capacity means that there can be several methods and approaches actively used in parallel. A universal evaluation across the observing community is required to agree best practices, and OBPS is introducing two processes to support practitioners in evaluating which best practives might be most suitable for their needs. The first is an endorsement process in which groups of experts (initially the GOOS Expert Panels) will identify and 'endorse' best practices (this may be more than one for a given activity). The second is implementing a community endorsement function that at its simplest represents a 'thumbs up' vote and a more sophisticated function for practitioners to contribute comments about a community practice to the OBPS record and have a direct dialogue with the best practice creator. To maintain a dialogue with the ocean observation community, OBPS also hosts an annual "Ocean Best Practices Workshop" (started in 2017) which provides practitioners with the opportunity to make recommendations to tailor OBPS to their needs; be actively involved in OBPS and also in the evolution of BPs.

55. OBPS is a partner in scientific projects such as H2020 EuroSea, JERICO S3 and CAPARDUS, and benefits from direct involvement with the international research community. It provides discovery and access to community practices for the full value chain from observations and platforms to applications and societal impacts. Community feedback on best practices from the "OceanObs'19 Conference", the "OceanObs RCN workshop", the United Nations Decade of Ocean Science for Sustainable Development regional meetings and other recent community meetings evidences the growth of interest in creating and adopting best practices for ocean research and applications and acknowledges the benefits of the OBPS.

56. The World Ocean Database (WOD) is the world's largest collection of vertical profile data of ocean characteristics available internationally without restriction. The World Ocean Database was first released in 1994 and updates have been released approximately every four years. By the end of 2019 the database contained nearly 17 million casts (sets of profiles).

57. Between June 2019 and March 2020, 2 million presence records were added to OBIS from 121 new datasets, providing 2,340 new marine species to OBIS. In total, OBIS now has 58.7 million occurrences of 127,804 species from 3,126 datasets. A milestone in 2019 was the switch to the new OBIS infrastructure and technology stack (OBIS2.0). This new OBIS system supports continuous data harvesting from OBIS nodes for near-real time updates. The new system does automated processing (QC) of ingested data and completes the data integration routines within minutes to an hour. The system is now also fully aligned with the World Register of Marine Species (WoRMS), which means that records are dropped when species names that are not in WoRMS or listed as non-marine. The information portal also provides details on quality issues and a more powerful mapper allows the users to visualize, filter, explore and download millions of records.

58. During the Eighth session of the IODE Steering Group for OBIS (5–8 November 2019) in Santa Marta, Colombia, an OBIS Data Quality Assessment and Enhancement Project Team was established to finalize work on documenting the logical data flow through the OBIS system from source data processing at OBIS Nodes to the data processing pipeline into the OBIS integrated database. The quality assessment (or fitness-for-use assessment) steps will be documented and logically organized and then translated into process code/function changes. This will also help the OBIS Capacity Development Task Team, who will, in collaboration with the OceanTeacher Global Academy, organize a "Training of Trainers" certification course, to level up the capacities of the node

managers and data managers in the new OBIS technologies and methods. The OBIS vocabulary infrastructure project team, in collaboration with the Biodiversity Information Standards (TDWG) group, will review, evaluate and produce a registry of vocabularies in use in OBIS. This will contribute to the best practices of the biological and ecosystem Essential Ocean Variables (EOVs) of GOOS.

59. The OBIS steering group unanimously approved the proposal to change the name of OBIS from Ocean Biogeographic Information System to Ocean Biodiversity Information System, while keeping the same acronym. Ms Martha Vides (INVEMAR/OBIS Colombia) is replacing Mr Eduardo Klein (USB, Venezuela, Caribbean OBIS) as co-chair of the OBIS Steering Group, who served his two terms. The 22 May 2020, OBIS will celebrate its 20th anniversary.

Key Challenges Encountered in Implementation and Remedial Action Taken

60. Much of the distributed office supporting the Global Ocean Observing System is outside of IOC/UNESCO Headquarters (HQ) and supported by volatile in-kind or voluntary contributions since the withdrawal of the US financial support. With these limited resources, the balance of 'inward' activity connecting to the core ocean observing community and helping them on coordination and best practices, *versus* 'outward' partnership-building, communication and advocacy activity is difficult to sustain. At the regional level, the importance of nurturing more partnerships between IOC activities and universities and science associations and networks has been identified, as well as developing partnerships with industry.

61. GOOS staff have engaged in the G7 Future of Oceans and Seas as a way of increasing voluntary contributions. Every effort is put into expanding the resource base as the only way to address both broad objectives of inwards coordination and outwards engagement.

62. Lack of national coordination regarding coastal and marine matters hampers the establishment of national data and information management facilities at the national level. An outreach campaign is developed to increase the awareness of Member States of the importance of national ocean data and information management expertise.

63. Regarding IODE, out of the 11 staff (10.5 FTE) currently working for IODE (8 at the IOC Project Office for IODE), only two are employed on UNESCO regular programme positions, 3.5 FTEs are seconded by the Flanders Marine Institute (funded by the Government of Flanders, Kingdom of Belgium) and five are project appointments or consultants. Two of these are also providing part-time IOC software development and system management support for all of IOC. For example, the OBIS data manager is developing new data portals for GOSR, SDG14.3 OA and HAB. The role of IODE as a cross-cutting programme supporting other IOC programmes in data and information management increases. However, the current level of staffing is not sufficient and a more solid foundation is essential to maintain these services in a sustained and long-term basis. In order for OBIS to respond to the growing demand in providing user support and to deliver key products and services (e.g. support to the CBD and global assessments under IPBES and UN Regular Process) as well as to cover the day-to-day management and maintenance of the infrastructure a full-time data manager is urgently needed. In addition, to further develop and maintain the other IOC data portals and websites (e.g. GOSR, OA, HAB…), IODE will need an additional full-time software engineer.

64. While the data and information made available by an increasing number of stakeholders is increasing rapidly, the IODE network has difficulties mapping and monitoring the data and information flow, resulting in duplicates, near-duplicates and loss of provenance metadata. This will be a priority to be addressed by ODIS, the Ocean Data and Information System. Closer cooperation with the real-time ocean observing community (GOOS) is also a priority for IODE.

FUNCTION C: EARLY WARNING AND SERVICES

Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards

Function C centres around four main programmatic components: (i) the global Tsunami Warning System; (ii) the Global Sea Level Observing System (GLOSS); (iii) Operational Ocean Forecast Systems services under JCOMM[4]; and (iv) the Harmful Algal Bloom programme.

Tsunami Warning Systems

65. The main elements of the Tsunami Programme focus on: (i) secretariat support to the four Intergovernmental Coordination Groups (ICG) and respective technical working groups and task teams under the four regional Tsunami Warning and Mitigation Systems in the Caribbean (CARIBE-EWS), Indian Ocean (IOTWMS), Pacific (PTWS) and North-East Atlantic, Mediterranean and connected seas (NEAMTWS) as well as the Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) which address inter-ICG and cross-cutting coordination and harmonization; (ii) preparedness and awareness courses and workshops; and (iii) enabling research and policy development.

Support for the intergovernmental coordination of regionally harmonized tsunami warning systems

66. Governance meetings and technical working group meetings set the strategic directions and facilitate the ongoing development, guidance and harmonization of the four regional tsunami warnings systems. In the IOTWMS, integrated meetings of the Working Groups, Task Teams and Steering Group were organised during 29 September–2 October 2019 hosted by Indonesia at BMKG, Jakarta. ICG/NEAMTWS held one ICG meeting (2–4 December 2019 Cannes, France). Due to the Coronavirus global health emergency the ICG/CARIBE-EWS postponed to 2021 the holding of its annual meeting originally scheduled on 4–7 May 2020, and replaced it with a virtual Officers Meeting on the same dates. The ICG/PTWS cancelled its biannual PTWS Steering Committee meeting 15–19 June 2020 and replaced it with a virtual meeting on the same dates. Planning is ongoing for the ICG/PTWS-XXIX session to be hosted by Japan from 15 to 18 March 2021.

National and sub-regional Tsunami Warning system developments

67. Active investments of nations and/or their concerted actions contribute substantially to the development of the Tsunami Warning Systems.

68. The Portuguese Sea and Atmospheric Institute (IPMA) has gone through the ICG/NEAMTWS accreditation process in 2019 and has met the requirements to be a Tsunami Service Provider, becoming the fifth in NEAM region.

69. Turkey and Greece enhanced their tsunami early warning system at the local level with the support of the European Commission (EC) and the Joint Research Centre (JRC) Last Mile Projects following the Bodrum-kos Tsunami (20 July 2017). This included capacity development in support of local tsunami warning, awareness, and mitigation, infrastructure, research, new sea level instrumentation and provision of measurements in Kos (Greece) and Bodrum (Turkey). The Last Mile Projects implemented have helped to develop procedures for local Tsunami Risk Assessment and Preparedness in Kos and Bodrum.

70. The South China Sea Tsunami Advisory Center (SCSTAC) became fully operational on 5 November 2019, coinciding with the World Tsunami Awareness Day. The primary mission of SCSTAC is to provide timely advisories on potentially destructive tsunamis to officially designated National Tsunami Warning Centers (NTWCs) and Tsunami Warning Focal Points (TWFPs) in Brunei (Negara Brunei Darussalam), Cambodia, People's Republic of China, Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam.

[4] JCOMM was abolished at the 30th session of the IOC Assembly and activities under JCOMM are expected to end in 1st half of 2020 and transfer to new parent bodies.

71. The Ninth Meeting of the ICG/PTWS Regional Working Group on Tsunami Warning and Mitigation System in the South China Sea Region (WG-SCS) originally scheduled on March 2019, in Guangzhou, China, was postponed to November 2020, due to the Coronavirus global health emergency.

72. The ICG/PTWS Working Group for the South East Pacific—CPPS Grupo de Trabajo de Alerta de Tsunami del Pacifico Sudeste—met on 29–31 October 2019, hosted by Colombia. The group objective is to enhance the capacities of the National Tsunami Warning Centres (NTCW) across the South East Pacific Tsunami Warning Member States, based on the Sendai Framework for Disaster Risk Reduction 2015–2030.

73. IOC was successful in securing funding from UNESCAP to implement a project on “Strengthening Tsunami Early Warning in the North West Indian Ocean region through Regional Collaboration”. Being implemented in India, Iran, Pakistan and Oman, this project aims to strengthen end-to-end tsunami warning SOPs to suit a near-field tsunami threat from the Makran region and develop a unified Probabilistic Tsunami Hazard Assessment (PTHA) for the Makran region. Activities in the inter-sessional period include: (i) high-level conference on near-field tsunamis in the Makran region (Muscat, 1–2 September 2019); (ii) Expert meeting for establishment of a regional working group on risk knowledge (Muscat, 3–6 September 2019); (iii) Expert meeting for development of a Probabilistic Tsunami Hazard Assessment for Makran region (Hyderabad, 2–4 December 2019); and (iv) SOPs for Tsunami Early Warning (Karachi, 28–28 February 2020).

Tsunami Exercises

74. Tsunami exercises and drills help to increase tsunami preparedness and awareness of coastal communities. Regular exercises are essential to maintain operational readiness of response agencies and exercises test communications, review agency standard operating procedures, and promote emergency preparedness.

75. Exercise CARIBE WAVE 20 took place on 19 March 2020 at 14:00:00 UTC with the following two hypothetical earthquake and tsunami scenarios: (a) a tsunami generated by a magnitude 8.0 earthquake located on the Enriquillo-Plantain Garden Fault Zone in Jamaica, and (b) a transoceanic tsunami generated by a magnitude 8.5 earthquake located off the coast of Portugal. Due to the Coronavirus global health emergency the exercise was limited to communications test only.

76. The first regional tsunami drill for Central America (Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) took place on 19 August 2019, prepared by the Central American Tsunami Advisory Center (CATAC) as decided by the Regional Working Group for the Pacific Coast of Central America of the ICG/PTWS, at its Fourth Session in Managua, Nicaragua, 11 February 2019 (ICG/PTWS-WG-CA-IV/3).

77. Planning for Exercise Indian Ocean Wave 20 (IOWave20) that is scheduled to be held on 6, 13 and 20 October 2020 is underway with guidance from the IOWave 20 Task Team.

78. Planning is also underway for NEAMWave 20 Exercice (2–5 November 2020).

Strengthening the work of regional Tsunami Information Centres

79. Tsunamis happen infrequently and community awareness of tsunami risk and preparedness is essential. In each of the four regional tsunami warning systems Tsunami Information Centres have been established. The role of TICs are to provide awareness information on tsunami and other sea-level related hazards to the general public and communities. The Tsunami Information Centres also facilitate the “Tsunami Ready”—an IOC pilot community recognition programme that promotes tsunami hazard preparedness as an active collaboration of national and local emergency management agencies, community leaders and the public.

80. The International Tsunami Information Center (ITIC) hosted by the NOAA National Weather Service of United States continued to play a key role in the reinforcement of capacities of key stakeholders in the Pacific Tsunami Warning and Mitigation System (PTWS), through the co-organisation of several trainings together with and in the framework of the IOC Tsunami programme.

81. With financial support from the European Union, the Caribbean Tsunami Information Center (CTIC) and the Caribbean Disaster Emergency Management Agency (CDEMA) hosted a Regional Tsunami Training Workshop in Barbados on July 23–26, 2019, with 30 participants from over 10 countries.

82. Within the CARIBE-EWS key activities were implemented to enhance Member State capacities in the development and operations of their tsunami early warning systems. UNESCO/IOC and its CTIC provided continued support to Member States in the implementation of the ICG/CARIBE-EWS Community Based Tsunami Performance Pilot Programme (Tsunami Ready) which resulted in the recognition of 5 new pilot communities in Antigua and Barbuda, Barbados, Dominican Republic, St. Vincent and the Grenadines and Trinidad & Tobago.

83. The Indian Ocean Tsunami Information Centre (IOTIC) supported under the BMKG-IOC partnership continued to play a key role in co-organisation of capacity development activities including IOTR piloting, trainings on Standard Operating Procedures (SOPs) and national trainings on UNESCO-IOC Tsunami Ready piloting.

84. A strategy for NEAMTIC was developed in 2018 to guide the future development of NEAMTIC. The strategy provides an action plan with three phase implementation: (i) NEAMTIC website maintenance and updates; (ii) redevelopment of NEAMTIC website; and (iii) development of NEAMTIC as a training centre/platform. Phase 1 is now completed and phase 2 has started, while phase 3 will depend on additional funding and organisation.

World Tsunami Awareness Day

85. In commemoration of 15 years of the 2004 Indian Ocean tsunami and World Tsunami Awareness Day (WTAD-2019), an Indian Ocean regional workshop on strengthening tsunami warning chain to critical infrastructure (ports, harbours and coastal airports) was organized by the IOTIC, ICG/IOTWMS and BMKG in Jakarta during 20–22 November 2019. The workshop highlighted that many ports, harbours and coastal airports bordering the Indian Ocean do not have an assessment of tsunami hazard and risk to their facilities. Knowledge of official warning products and direct access to official tsunami warning information from the National Tsunami Warning Centres (NTWCs) is limited. There is a need for guidance and capacity to develop actionable warning products for key stakeholders, tsunami standard operating procedures, emergency response plans as well as preparedness and awareness initiatives. The workshop highlighted the urgent need for critical infrastructure facilities to work closely with relevant experts and national authorities to bridge these gaps.

Targeted capacity development and technical assistance

86. Human and national capacity to deal with tsunamis are still unevenly spread among nations. Since its start the Tsunami programme has contained a strong capacity development component. The aim of these activities is to enable Member States to understand its risk and know ways in which they can mitigate the hazard, provide warning to its populations in a timely manner, and be able to carry out awareness and preparedness activities to sustain knowledge and ability-to-respond across generations.

87. The ICG/IOTWMS undertook several focussed capacity development activities including trainings/workshops on SOPs and Hazard Assessment. In support of implementation of UNESCO-

IOC Tsunami Ready piloting in the Indian Ocean, a national training programme and verification visit of Tsunami Ready indicators was organized by the IOTIC and ICG/IOTWMS in Hyderabad and Odisha, India, during 10–14 December 2019. Following the piloting of Tsunami Ready indicators in six communities in India and one community in Oman during IOWave18, Boxipalli and Noliashahi communities in Odisha province of India have now requested for UNESCO-IOC Tsunami Ready recognition. The ICG/IOTWMS continues to conduct biannual communications tests in June and December each year with the most recent test in December 2019 attracting participation of 25 active National Tsunami Warning Centres.

88. In the framework of the last phase of the European Union funded DIPECHO project “Building resilient communities and integrated Early Warning Systems for tsunamis and other ocean related hazards in Central America” (2016–2017), trainings and workshops were organized between July and October 2019 in Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, and Panama, which included development and/or reinforcement of tsunami Standard Operating Procedures, community level tsunami drills and elaboration of tsunami educational materials jointly with their ministries of Education. This contributed to better prepare participating national agencies and beneficiary communities towards coastal hazards in particular tsunami. The project was key to complete Tsunami Ready pilot recognition for 10 Central America Municipalities: Corn Island and Bluefields (Nicaragua), La Libertad and Tamanique (El Salvador), Omoa and Tela (Honduras), Sipacate and San José (Guatemala), Playa Hermosa (Costa Rica) and Puerto Armuelle (Panama).

89. The PTWS Regional Working Group on Tsunami Warning and Mitigation System for the South China Sea Region (WG-SCS), organised the IOC South China Sea training for seismic and sea level operators: enhancing the capacity of tsunami observation and data sharing in the South China Sea region, 21–25 October 2019, Hangzhou, China. The South China Sea Tsunami Advisory Center (SCSTAC) in collaboration with the IOC, and the National Oceanic and Atmospheric Administration (NOAA), United States, organized the training, hosted by the National Marine Environmental Forecasting Center (NMEFC) of the Ministry of Natural Resources (MNR) of China. Twenty three participants from 6 countries attended this training.

90. With funding from the European Civil Protection and Humanitarian Aid Operation (ECHO), in the framework of the project “Strengthening capacities of early warning and response for tsunamis and other coastal hazards in the Caribbean”, a sub-regional tsunami response coordination plan for CDEMA Participating States focusing on the CDEMA-led Regional Response Mechanism (RRM) was developed. Several trainings, workshops and drills were organised on National Standard Operating Procedures (SOPs), Emergency Response Plans and Tsunami Ready recognition processes, in Antigua and Barbuda, Barbados, Dominican Republic, St. Vincent and the Grenadines and Trinidad & Tobago.

91. Training courses were organised on PTWC Enhanced Products and Standard Operating Procedures (SOPs) on 5–8 August 2019, in Port Moresby, Papua New Guinea, and on 14–24 October 2019, Nuku'alofa, Tonga. These trainings follow the tsunami warning chain from detection and threat analysis to warning dissemination, and cancellation. Topics include earthquake and tsunami science, warning center operations, use of the Pacific Tsunami Warning Center products and decision-support tools, and public information or media engagement. Emphasis is on the importance of Standard Operating Procedures (SOPs) for enabling consistent and rapid tsunami warning.

92. The 2019 annual ITP-ITIC-IOC training course (3–13 September 2019) was hosted by the International Tsunami Information Center (ITIC), in collaboration with the Pacific Tsunami Warning Center and technical and emergency management partners in Hawaii (USA). The ITP-Hawaii demonstrated a working example of an end-to-end tsunami warning and mitigation system centered in Hawaii, with PTWC as its local tsunami warning centre. ITIC is hosted by the US National Oceanic and Atmospheric Administration and the Hydrographic and Oceanographic Service (SHOA) Chile in partnership with IOC.

93. A regional training course on TEMPP1 (Tsunami Evacuation Maps, Planning and Procedures, course 1) was organized on 30 September–4 October 2019, in Nadi, Fiji. The training was jointly organised by the Pacific Community (SPC), ITIC and IOC. TEMPP1 covers the explanation and use of inundation models for evacuation modeling. Topics include earthquake tectonics, tsunami science, bathymetric and topographic grids, earthquake source parameters, forecast methodology, tsunami modeling, tsunami hazard assessment and use of the MOST model and ComMIT interface tool. The TEMPP training course is intended to be a standardized course and process for the production of reliable and practical community-level tsunami evacuation maps. The direct outcomes are communities that know what to do and where to go when a tsunami warning is issued, or when self-responding to the natural warning signs of a tsunami. Upon completion, countries should have the capability and tools to replicate the community evacuation map process elsewhere in their country.

94. Several Member States of North-Eastern Atlantic, the Mediterranean and Connected Seas Tsunami Warning and Mitigation Systems (NEAMTWS) commemorated the World Tsunami Awareness Day in 2019. A Tsunami exercise was organized in Latina, Italy on 10 October 2019. The exercise tested standard operating procedures of institutions and municipalities that manage a tsunami risk emergency. As part of the Tsunami Last Mile research project funded by the European Commission DG ECHO, Turkey and Greece carried out several tsunami activities aligned with the World Tsunami Awareness Day. Turkey carried out two tsunami awareness raising and preparedness seminars and one table-top exercise. The tsunami awareness-raising seminar occurred in a primary school in Bodrum, Turkey, while a preparedness seminar was held at a hotel. In Kos, Greece, an earthquake and tsunami preparedness exercise was organized. The exercise tested the effectiveness of a new series of technological solutions, developed by the Joint Research Center (JRC) to provide tsunami early warnings to the local population, its integration into the municipality emergency management plan and procedures, and its interface with the national tsunami warning system.

Support for enabling research and policy development

95. Ongoing improvements of Tsunami warning systems and mitigation efforts are important. They contribute to sustain the system, reduce costs and uncertainty, and maintain public trust.

96. The Tsunami community has contributed actively to the development of the Implementation Plan for the UN Decade of Ocean Science for Sustainable Development. The community has participated in several of the regional planning meetings and the community has outlined the transformational steps that should be undertaken to develop more timely and accurate tsunami detection, measurement, and forecasts over the next decade (see Angove et al., 2019, *Ocean Observations Required to Minimize Uncertainty in Global Tsunami Forecasts, Warnings, and Emergency Response*, Frontiers of Mar. Sci., 25 June 2019, https://doi.org/10.3389/fmars.2019.00350).

97. IOC, through IOTIC, IOTWMS Secretariat and the Republic of Indonesia, organised the symposium on Lessons learnt from the 2018 Tsunamis in Palu and Sunda Strait on 26–28 September 2019 at BMKG, Jakarta, Indonesia that was attended by 270 participants from 24 countries. While tsunami warning systems have proven to be effective in mitigating the impact of tsunamis globally, Palu and Sunda strait tsunamis highlighted the challenges that we continue to face in handling tsunamis from non-subduction, aseismic and near-field sources. The Symposium emphasized the urgent need to update hazard assessments, strengthen warning capabilities and enhance community preparedness to deal with such events. It is important to assess the possibilities and limitations of scientific knowledge and technology vis-à-vis the information needs of disaster managers, and make continuous improvements in both technical and social components of tsunami early warning systems. The symposium statement is available at:
https://unesdoc.unesco.org/ark:/48223/pf0000372721.locale=fr .

98. The IOC and the Government of Ecuador organised the ICG/PTWS Scientific meeting of experts to understand tsunami sources, hazards, risk and uncertainties associated with the Colom-

bia-Ecuador Subduction Zone, 27–29 January 2020, Guayaquil, Ecuador. The purpose of this meeting was to identify sources of tsunamis that may affect the coastline of Colombia and Ecuador, and to assess the risks that arise from a local tsunami. The meeting focused on exploring tsunami sources in the Colombia/Ecuador coast, and more specifically on the Nazca-South America plates subduction zone.

Global Sea-Level Observing System (GLOSS)

99. Sea level is a fundamental parameter in the sciences of oceanography, geophysics and climate change. Changes in observed sea level occur across a wide spectrum from seconds and minutes (wind waves, earthquakes, tsunami), hours to days (tides, storm surges), years (seasonal cycles, El Niño), through to long term changes due to climate change and the slow vertical land movements which are still occurring following the last ice age. Knowledge of sea level gradients is essential for understanding the ocean circulation. Sea level data are of great practical importance to coastal populations in applications such as flood defence and navigation. Given the multi-dimensional, multi-purpose nature of tide gauge observations, there is considerable benefit to be gained from well-designed sea-level observing networks that support a broad research and operational user base. The Global Sea-Level Observing System (GLOSS) provide such a service. GLOSS provides oversight and coordination for global and regional sea-level networks in support of, and with direction from, the oceanographic and climate research communities. These communities are served by the four GLOSS data centers (i) the Permanent Service for Mean Sea Level (PSMSL, UK); (ii) the University of Hawaii Sea Level Center (UHSLC, USA); (iii) the Système d'Observation du Niveau des Eaux Littorales (SONEL–University of La Rochelle, France); and (iv) the Sea Level Station Monitoring Facility (hosted at the Flandern Institute of Marine Research, Belgium).

100. The GLOSS data centres are continuously and extensively used by the scientific and operational community—it is estimated conservatively that for 2017 alone more than 200 scientific publications were based on sea level data provided by the GLOSS data centres. Many of the sea level science publications enter into the review of the IPCC and contribute to for instance the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (published in September 2019) and which provided new upwards revised projection for global sea level rise by 2100.

101. Aside from scientific publications, operational products are also generated based on the sea level data availability. As an example, the IOC Sea Level Station Monitoring Facility tracks some 920 (858 in 2018) active stations that deliver data in real time (e.g. for tsunami monitoring). The SLSMF registered 3.6 billion web hits (1.94 billion in 2018) for 2019, and approximately 25 TB (21 TB in 2018) of data was downloaded during 2019.

102. GLOSS organized its first ever Workshop on Sea level Data Archaeology (10–12 March 2020, Paris). It follows the recommendations from the joint meeting between the Tides, Water Level and Currents Working Group (TWCWG) of the IHO and the GLOSS Group of Experts from 11 to 13 April 2019, Busan (Republic of Korea). Historical tide measurements are among the oldest direct observations which provide relevant information regarding the long-term evolution of mean sea-level. In many countries, systematic sea level observations have been carried out since the early to mid-1800s. Despite this rich historical legacy, documents with these records are hidden in archive centres. Most of these analog documents are not adequately inventoried. The workshop covered: (i) historical sea level data inventories and data at risk; (ii) Methodology for transfer of paper records to digital data; (iii) Auxiliary historical archives relative to sea level; (iv) Applications and knowledge products from recovered data; and (v) Cooperation perspectives. The workshop was very successful and had 55 registered participants (including many young scientists), and adopted a set of recommendations to guide future sea level data rescue activities and coordination. Recommendations and report are available from http://www.ioc-unesco.org/workshop-sea-level-data-archaeology .

103. GLOSS finalized the *Manual on Quality Control of in situ Sea Level Observations* (Vol. I: A review and progress towards automated quality control). The objective of this manual has been to

compile and update the standards and best practices on quality control of tide gauge data. Although related Information has been included in the IOC Manuals on Sea Level Measurement and Interpretation (Volumes I, II, III, IV, V: IOC,1985,1994, 2002, 2006, 2016), this is the first time that detailed information on quality control procedures has been assembled into one document, addressing new issues like automation, for management of hundreds of long-time series, or near-real-time quality control procedures, for operational applications.

104. IOCINDIO organized a scientific, technical and institutional innovations workshop in order to assist Member States in the region to build their national and regional Framework and Guidelines for Coastal Vulnerability Assessment in the context of Sea-level rise and Storm Surges, with the kind support of the newly established International Training Centre for operational oceanography under the auspices of UNESCO (Category 2) at the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad, India (27–31 May 2019).

JCOMM Services

105. The IOC Assembly decided through Resolution XXX-2 (2019) to incorporate the JCOMM Expert Team on Operational Ocean Forecasting Systems (ETOOFS) into the Global Ocean Observing System (GOOS), with functional connections to the WMO Infrastructure Commission. ETOOFS met 3–4 February 2020 at IOC headquarters with a main goal of advancing the writing of a 'Guide to Operational Ocean Monitoring and Forecasting Systems,' now foreseen for publication as an IOC and WMO Guide in 2021. The Team is actively engaging in the GOOS Steering Committee as an *ex officio* member, and preparing engagement with the observing and service delivery inputs and outputs of operational ocean forecasting systems. The guide promises to be a good basis for developing the capacity of new entrants in forecasting systems and the development of local ocean-related services.

Harmful Algal Bloom programme

106. IOC priorities and actions on Harmful Algal Blooms are set by the IOC Intergovernmental Panel on Harmful Algal Blooms (IPHAB) and the programme is implemented via number of global and regional initiatives. The research component under IPHAB, GlobalHAB, which is jointly sponsored with SCOR, has implemented a number of initiatives from its *Science and Implementation Plan*. The IOC Science and Communication Centre on Harmful Algae at the University of Copenhagen serves as an implementation mechanism and fundraising partner for HAB and GlobalHAB activities.

107. Impacts of harmful algae on aquaculture, food safety, fisheries, tourism and other ecosystem services are permanent and widespread and intensify proportionally to the exploitation of the coastal seas. Routine monitoring and appropriate management plans can to a large degree prevent or minimize impacts. IOC priorities and actions on Harmful Algal Blooms have been since 1992 set by the IPHAB and the work programme is implemented through number of global and regional initiatives.

108. An international GlobalHAB workshop on evaluating, reducing and mitigating the cost of harmful algal blooms was organized in Victoria, British Columbia, Canada on 17–19 October 2019 as part of the Annual Meeting of the North Pacific Marine Science Organization (PICES) and received additional co-sponsorship from NOWPAP, ISSHA and US NOAA.

109. It has for several years been on the priority list of both IPHAB and GlobalHAB to focus specifically on Fish Killing HABs. An international workshop was held in Puerto Varas in the South of Chile June 2019 co-funded by the Chilean Centre for Studies of Harmful Algae (CREAN). HAB related fish kills are a very important issue for salmon culture.

110. GlobalHAB has formed an editorial board to develop a 'Best Practice Guidelines for the Study of HABs and Climate Change' to focus research on the occurrence of HABs under changing climate conditions. The draft chapters were in review by end 2019.

111. GlobalHAB is also focusing is on HAB event modelling with a strong training component including development of an online textbook on HAB modelling. This was scheduled for May 2020, but has been postponed to May 2021. This product will come one year later.

112. A special issue of the journal *Harmful Algae* (Impact Factor 4.138) on HABs and climate Change was published in February 2020. A 'IOC-SCOR Scientific Summary for Policy Makers on HABs and Climate Change' is being developed based on the main messages in the papers of the special issue. The draft was presented at 14th intergovernmental session of IPHAB in Paris, on 24–26 April 2019.

113. Collaboration between GlobalHAB and GO_2NE has been initiated and a joint expert meeting on HABs and deoxygenation was held on 11–12 June 2019 in Paris. GlobalHAB is also covering brackish and freshwater HABs and has published a scientific summary for policy-makers entitled *Solutions for managing cyanobacterial blooms*.

114. There is rapid technological development in different types of observation systems and GlobaHAB is jointly with SMHI/Sweden organizing an international workshop to test, inter-compare and train participants in various automated and non-automated observation technologies. Unfortunately, the workshop has been postponed due the Covid-19 situation.

115. A new GlobalHAB initiative is addressing the mass occurrences of the macro algae Sargassum in both West Africa and the Caribbean. A sub-committee is established with an initial focus to join a GESAMP Task Team on Sargassum in organizing an Open Science Meeting (OSM) on Sargassum. This will involve the GESAMP technical secretaries of the sponsoring agencies that have indicated an interest in this topic (IOC, UN Environment, FAO, UNDP, WMO, IAEA) It is intended that the results of the OSM will be published as a white paper or peer-reviewed journal and will form the basis for GlobalHAB's and GESAMP's future engagement in the Sargassum issue. The dates for the OSM to be held in Mexico are pending the current Covid-19 situation.

116. The comprehensive undertaking to develop the first Global HAB Status Report (GHSR) based on data compiled in IOC/HAEDAT, OBIS and the literature continues with the collaboration of IAEA, ICES, and PICES and with the financial support of Flanders (Kingdom of Belgium). The GHSR launch was foreseen for May 2020 but has been postponed due to the Covid-19 situation.

117. The IOC-IAEA-FAO-WHO Inter-agency Joint Strategy on Ciguatera Fish Poisoning is being further developed and implemented though joint workshops and alignment of agency workplans and a draft Memorandum of Understanding was signed by IOC in 2019.

118. Through the IOC Science and Communication Centre on Harmful Algae the longstanding opportunities for capacity enhancement in monitoring of HABs continue with several annual courses. Concluding examinations give the trainees certification in identification of HAB causative species. All courses are run within the IOC Ocean Teacher platform and include a combination of preparatory e-learning, hands-on practical courses and an examination. The IOC Centre collaborates with the Marine Institute (Ireland) in operating the International Phytoplankton Inter-calibration (IPI) which in 2019 had 98 participants from 50 laboratories. The number of Member States participating is increasing. New laboratories from Cuba and Nicaragua were participating for the first time. There is an increase of participation from South America and Africa as well. IPI is also established within the Ocean Teacher platform. Accreditation of the IPI under ISO17043 is being prepared.

Marine invasive species

119. One million species are on the verge of extinction and the introduction of non-indigenous species (NIS) to new environments is listed as one of the five key drivers impacting biodiversity, according to the recent IPBES global assessment. Small Islands Developing States are particularly vulnerable to such a risk, which also creates a real biosecurity risk for human health and the sustainability of livelihoods. It is widely recognized that ship's ballast water and vessel biofouling, including the surge of new (or larger) marine structures linked to the unfolding and fast-growing blue economy, are the main vectors for the introduction and spread of NIS in the marine environment. The Government of Flanders (Belgium), through FUST, is funding a 3-year (2020–2022) project named Pacific islands Marine bioinvasions Alert Network—PacMAN (https://pacman.obis.org/) to develop a national invasive species monitoring system as well as an early-warning decision-support tool for Pacific SIDS, offering a user-friendly dashboard indicating the potential presence of invasive species (including pathogens and pest species) or risk of invasions to support local management. The project will achieve this goal through a work plan that includes: (i) needs assessment and review of current best practices in detecting invasive species; (ii) training of local scientists in field sampling, sample processing, DNA sequencing and data management; (iii) establishing and operating national invasive species monitoring plans; (iv) building a bioinformatics pipeline to improve the availability of metabarcoding data from biofouling communities and feed these into global data infrastructures; and (v) developing the decision-support tool. Strong stakeholder engagement will ensure that the marine bioinvasions monitoring plan and the information and services of the decision-support tool contribute to and meet the requirements of local management (triggering rapid response). The project is coordinated by the OBIS secretariat at the IOC Project Office for IODE in Ostend (Belgium) with the support from the Institute of Applied Science of the University of the South Pacific as the local implementing partner.

Key Challenges Encountered in Implementation and Remedial Action Taken

120. The Covid-19 pandemic has led to postponement of many meetings, trainings and community preparedness activities. Some meetings are re-arranged as teleconferences but delays are foreseen in implementing field activities. Ongoing reassessment of activities will be needed as lockdown measures ease.

121. The pandemic is also expected to impact Seismic, Sea level measuring station and Tsunameter Networks as well as operations of Tsunami Service Providers (TSP), especially if the situation is not going to improve in the near-term. Impacts on data delivery and TSP operations, both regionally and globally, will be tracked in order to assess and collectively operate the tsunami warning system as best we can. IOC will collate the information and share with operators, Member States and ICGs, in order to assess the major risks across the warning system, seek ways of restoring the system, and to find opportunities to pool resources, where this might make sense, in order to maintain critical function.

122. Current and future work of the ICG/IOTWMS is focused towards system sustainment and enhancements, strengthening early warning in the Makran region as well as enhancing community awareness and response. There are several gaps in observing networks that need wider data sharing among Member States. The Palu and Sunda Strait tsunamis in Indonesia have once again highlighted the urgent need to enhance community preparedness for near-field tsunamis, and at the same time strengthen warning systems to be able to warn for tsunamis caused by non-subduction and aseismic sources. The Indian Ocean Tsunami Ready (IOTR) programme that provides a structured framework for enhancing the state of community readiness has attracted interest of several Member States in the Indian Ocean and needs to be encouraged. Core funding for the IOTWMS Secretariat provided by the Government of Australia through the Bureau of Meteorology (BoM) continues to be vital for the stability of the Secretariat and the ICG. Activities supported by BMKG, Indonesia as part of their ongoing support for IOTIC are leveraged in planning inter-sessional activities, as integrated meetings, to maximise Member State participation.

123. Within NEAMTWS just over half of the Member States presently subscribe to the alert services from the Tsunami Service Providers (TSPs). IOC continues to raise awareness of these services. Over the last three years several tsunamis have been recorded in the NEAMTWS region e.g. Lithakia (26 October 2018), Aegean Sea (21 July 2017), in Alboran Sea (25 January 2016) and in the Ionian Sea (17 November 2015). Although moderate in size, these events highlight the tsunami threat, and underlines the need for optimizing the warning system and significantly enhance tsunami preparedness through education and awareness in the region.

124. There continue to be gaps in the seismic and sea-level detection network notably in North Africa. Some countries have difficulties with data sharing for various reasons. The implication is sub-optimal performance of the regional Tsunami Warning Systems. IOC continues to appeal to Member States to participate and contribute fully in NEAMTWS.

125. The on-going development of the global tsunami early warning system (TEWS) requires continuous development of all of its elements to effectively prepare for and respond to the threats posed by tsunamis and other coastal hazards. The activities of IOC in this field focus on building the institutional capacity of the national mandated bodies, reinforce community preparedness and organize and disseminate standards for tsunami-related services, and preparedness, readiness and resilience. With small core resources and significant extrabudgetary contributions, this task is becoming increasingly difficult. Staffing reinforcement is required to cope with it.

126. An improved coordination between IOC-HAB and HAB-ANCA regional initiatives allowed a better implementation of IOC Ciguatera Strategy and HAB programme in the IOCARIBE region. The work with health authorities has enhanced the implementation of practical solutions to address the vulnerability to the threat of toxic and harmful events in the IOCARIBE region.

FUNCTION D: ASSESSMENT & INFORMATION FOR POLICY

Support assessment and information to improve the science-policy interface

Sustainable Development Goals (SDG)

127. In the context of the 2030 Agenda for Sustainable Development, several targets of SDG 14 are directly relevant to the work of IOC, particularly in the areas of marine pollution, ocean acidification, ecosystem-based management, as well as marine research capacity and transfer of marine technology. IOC is identified as the UN custodian agency by the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) for SDG indicators 14.3.1 (ocean acidification) and 14.a.1 (scientific knowledge and ocean research capacity). IOC has recently provided reporting on both these indicators for inclusion in the UN Secretary General's Progress Report towards the SDGs that will be published prior to the High-level Political Forum on Sustainable Development in July 2020.

128. Significant progress was made in the collection of new data provided by Member States to IOC towards the SDG Indicators 14.3.1 and Target 14.a.1, for which the IOC has been assigned the custodianship role. Member States followed IOC’s invitations to contribute to the Global Ocean Science Report (GOSR) 2020 online questionnaire—the basis for 14.a.1 reporting and to the newly established ocean acidification data portal for 14.3.1 reporting, developed in collaboration between the Ocean Science Section and IODE. This new portal provides, hosted at IODE, helps Member States, NODCs, other organizations and individual scientists to submit ocean acidification data. IOC HQ and IODE further develop a user-friendly GOSR data portal, which allows open access to all GOSR2020 data, and in particular the 14.a.1 information. In February 2020 IOC reported to the IAEG on both indicators. Several activities were undertaken to advance the methodology of indicators for targets 14.3 and 14.a, as well as in relation to target 14.1 on marine pollution (Nutrients).

129. Concern over the impacts of altered nutrient inputs, N, P and Si, to coastal waters led the UN to include an “Index for Coastal Eutrophication Potential” (ICEP) as indicator for SDG Goal 14.1.1

on eutrophication: *By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution*. UN Environment is the custodian agency for Indicator 14.1.1, and the IOC is responsible to develop ICEP as the indicator. To implement ICEP, it is required to develop a component on a dissolved silica model and evaluate the effectiveness of ICEP in predicting coastal impacts at the global scale. To promote and increase the understanding of the potential of ICEP as indicator, the IOC in 2019 produced an animation for YouTube https://youtu.be/qW2nV2bsyCs. The detailed plan of work has been elaborated by the IOC N-CIRP Group of Experts in 2017. The work will require funding for two postdoctoral scholars and an expert workshop to validate models and will extra-budgetary funding. To date no funding source has been identified and ICEP will not be ready to be implemented by end 2020 as originally foreseen. Unless funding is identified, IOC will be unable to deliver the fully developed Indicator for 14.1.1.

General Bathymetric Chart of the Oceans (GEBCO)

130. The 36th Meeting of the GEBCO Guiding Committee (GGC) and associated meetings took place in Portsmouth, new Hampshire, USA on 7–8 November 2019 back to back with the Map the Gap Symposium which focused on global and regional mapping challenges and opportunities and emerging technologies for bathymetry. The GGC recommended that IOC be asked to assist in encouraging coastal States to allow the collection and publication of data gathered in their waters of national jurisdiction in support of Seabed 2030 and the IHO Crowdsourced Bathymetry initiatives. It was proposed that a joint statement should be developed by the IOC and IHO Secretariats to articulate support for the release and publication of bathymetric data. It was suggested that the GEBCO engage directly with the IHO and IOC regional meetings to highlight the current restrictions and what actions individual coastal States could do to facilitate the exchange of bathymetric data. Further discussions took place on how to better align the Nippon Foundation-GEBCO Seabed 2030 project with the UN Decade. The GGC agreed on the continuation of the IOC appointed Member—Marzia Rovere for a second 5-year term.

131. The Nippon Foundation-GEBCO Seabed 2030 project, aimed at facilitating the complete mapping of the ocean floor by the year 2030 is proceeding with its implementation. IOC Executive Secretary participated in a special event organised at the Royal Society, London, UK, on 22 October 2019, where the new 2019 GEBCO-Grid, which has been developed through the Nippon Foundation-GEBCO Seabed 2030 Project, was announced. All data from the GEBCO_2019 Grid can be downloaded from the GEBCO website (gebco.net). At the event, through the support of the Nippon Foundation, it was announced that Seabed 2030 will provide vessels around the world with data-gathering equipment to enable them to contribute to the project. These vessels will have data loggers installed to record bathymetric information, increasing mapping capacity and capability and establishing new connections between Seabed 2030 and owners of vessels including fishing fleets, tourist boats, and pleasure craft. Seabed 2030 will also champion the development of innovative, scalable new solutions to increase the efficiency, safety, and cost-effectiveness of deep-sea mapping, paving the way for public participation on the widest scale possible to meet the project's goals. Finally, the appointment of Mr McMichael-Phillips as the new Director of Seabed 2030 was announced at the meeting.

Ocean and coastal Atlases

132. Work on the Caribbean Marine Atlas, an IODE project, has progressed well in accordance with the workplan: the CMA is an online digital platform that supports the integrated coastal zone management (ICZM) and ecosystem-based management for Large Marine Ecosystems in the Wider Caribbean region—mainly Caribbean and North Brazil Shelf Large Marine Ecosystems (the CLME+ Region). The Atlas is supporting the implementation of the CLME+ Strategic Action Programme.

133. In this context, CMA2 developed a new and updated workplan jointly with CLME+ in order to advance the prototype of the content for CLME+ SOMEE (State of the Marine Environment and associated Economies) information from the Atlas. Progress was made by publishing seven indicators. In addition, an "ecosystems' methodological sheet" was developed to advance on two more indicators. This is a country voluntary contribution to SDGs. The Atlas was launched on the Oceans World Day (8th June 2018) including the demonstration of the Atlas platform in three countries. Special attention is paid to coastal hazards, climate change and biodiversity, as well as habitats, fisheries and pollution—the three main transboundary problems identified in the CLME+ Region. CMA brings together 25 countries, 7 of which are actively providing ICZM national information and data for regional indicators. To continuing the sustainable operationalization of the Caribbean Marine Atlas, beyond CMA2, Member States and partners held a workshop for the formulation of a 3-year workplan (22–24 July 2019. Cartagena, Colombia). This new phase of the project has a strong national component that is critical for the CMA successful development. During the reported period, INVEMAR continued to provide 24/7 operation services and support, including technical advice to expert users, especially to CLME+ project and CMA Member States. A short review on CMA platform, community, and dissemination products was published in *POGO Newsletter*: Issue 38, November 2019.

134. In October 2019, the CMA became a Member of the IHO Meso-American Caribbean Sea Hydrographic Commission (MACHC) Marine Spatial Data Infrastructure Working Group (MMSD). This Group seeks to promote the development of MSDI within the region in support of numerous non-navigation users of marine (hydrographic / charting) data. The MACHC MSDI effort is based on the four pillars: (i) Policy & Governance; (ii) Technical Standards; (iii) Information Systems; and (iv) Geographic Content.

135. CMA currently holds more than 800 GIS layers. The Atlas is addressed to professionals in charge of planning and development, ministries and national and regional authorities, decision- and policy-makers. The CMA2 project, funded under the UNESCO/Flanders Fund-in-Trust has now started its final year.

136. The long-term strategic goal of the International Coastal Atlas Network (ICAN), under IODE, is to encourage and help facilitate the development of digital atlases of the global coast based on the principle of distributed, high-quality data and information. These atlases can be local, regional, national and international in scale. The ICAN is an IODE project since 2013.

Contribution to global ocean assessment processes

137. IOC continues to provide scientific and technical support to the World Ocean Assessment (WOA) process established under the UNGA. A second cycle of assessment (2017–2020) was initiated under the UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects, starting with the holding of five regional workshops in 2017 to build capacity, support the development of assessment(s) and facilitate outreach and awareness-raising. Financial support was provided to organise the meetings of the WOA Group of Experts in 2019 and 2020. Discussions with DOALOS (Secretariat of the Regular Process) have been conducted with regards to how the preliminary conclusions of the WOA-2, particularly in terms of knowledge and capacity gaps, could be addressed by the Implementation Plan of the UN Decade. The WOA-2 Report will be published at the end of 2020/early 2021.

138. Through the FUST-funded DIPS-4-Ocean Assessments project, OBIS contributed to the IPBES 'Global Assessment of Biodiversity and Ecosystem Services' (released May 2019, Paris), in particular in Chapter 2 of this report on "Status and Trends" (e.g. the map of global Diatom abundance is directly derived from OBIS and most of the global biodiversity indicators, as well as the "centres of rarity" have underlying layers extracted from OBIS). The OBIS Secretariat also contributed graphs and maps for two chapters of the second cycle of the Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects (i.e, World Ocean Assessment Report 2), namely Chapter 6: Trends in the biodiversity of main taxa of marine biota, subchapters (b) Marine invertebrates; and (c) Fish; and Chapter 7: Trends in the state of biodiversity in marine habitats, subchapter (o) Abyssal plains. The OBIS data and information products and scripts are available on https://github.com/iobis?utf8=✓&q=woa. The OBIS data access and enhancement services (r-packages robis and obistools) were also used in the creation of products for the European Atlas of Marine Life, for example in calculating the thermal affinities for European marine species, which is an interesting indicator to predict climate change impacts (global warming) on the distribution and composition of species communities. OBIS also provided statistics and maps of its HAB data for the Global HAB Status Report.

139. The IOC is a partner in the GEF-UNDP-IMO GloFouling Partnerships Project which is an intervention at the global, regional and national levels, with the aim to develop best practices and build capacity in developing countries for implementing the IMO and other relevant guidelines for biofouling management and to catalyse overall reductions in the transboundary introduction of biofouling-mediated invasive aquatic species. IOC has the lead in implementing and coordinating activities for the non-shipping aspects of the Project, including contributions from the private sector through the World Ocean Council. As part of the project the IOC is lead agency of a new GESAMP Working Group on biofouling management and non-indigenous species which will hold its first online meeting in May–June 2020. The expected outcome of the IOC-UNESCO component is capacity in developing countries for implementing the IMO and other relevant guidelines for biofouling management and to catalyse overall reductions in the transboundary introduction of biofouling-mediated invasive aquatic species.

Regional activities

140. UNESCO (through IOCAFRICA) and the UN Resident Coordinator for Mauritius and Seychelles are leading the development of a regional framework for Supporting Western Indian Ocean Island States to respond to transboundary challenges and opportunities resulting from climate change. The regional framework provides the opportunity for the UN to consolidate its actions, initiatives, investment and influence within the Western Indian Ocean to address transboundary challenges and opportunities on climate change. Through this framework, the UN agencies working in the region will support Comoros, Madagascar, Mauritius, Seychelles and Zanzibar in knowledge generation, research, sharing and exchange of best practices to improve ecosystems and biodiversity, build resilience and improve and the lives and livelihoods of the populations at hand. The workshop to consider the draft framework was planned for April 2020 but had to be postponed because of the Covid-19 crisis.

Key Challenges Encountered in Implementation and Remedial Action Taken

141. IOC's work in the area of assessments and information for policy is fully aligned with international commitments related to global assessments such as the UN World Ocean Assessment, the SDG reporting framework, IPBES, IPCC and some regional assessments. IOC's comparative advantage lies in its unique position as an intergovernmental framework that advances research, identifies new scientific issues through collaborative action, and thus acts as a conduit for delivering relevant information to support decision-making of Member States. However, whilst IOC contributes to global assessment processes, IOC efforts are not always clearly visible in the end product. There is therefore a need to both explain the essential role of IOC in the upstream efforts (in terms of science, observation and data requirement) that are essential in the compilation of assessment end-

products, and to increase the visibility of IOC's inputs to global assessment products, and develop relevant standalone assessment products, such as the State of the Ocean Report proposed by the IOC Executive Secretary. Core capacity related to the conduct of integrated marine assessment exists within the Secretariat, as well as expertise in indicator-based methodologies for assessing environmental, socio-economic, governance processes in the marine environment. To date, the Commission has been limited in its capacity for transforming and analyzing data into policy relevant products. However, the recent strengthening of the Marine Policy and Regional Coordination Section via a new P4 recruitment will contribute to the enhancement of the role and visibility of IOC in contributing to global assessment processes and developing its own assessment products.

FUNCTION E: SUSTAINABLE MANAGEMENT & GOVERNANCE

Enhance ocean governance through a shared knowledge base and improved regional cooperation

Sustainable Development Goals – Preparation for the 2020 UN Ocean Conference

142. Following the 2017 UN Ocean Conference on SDG 14, more than 1,600 registered commitments from governments, UN entities, NGOs, private sector and other stakeholders, have now been pledged. IOC has itself pledged 11 Voluntary Commitments as part of this process. In order to follow up on these commitments, foster new commitments and facilitate collaboration, the UN Special Envoy on the ocean, Amb. Peter Thomson, supported by UN DESA, established a network entitled "Communities of Ocean Action", organized around 9 thematic clusters addressing the SDG 14 targets. IOC together with the Global Environment Facility are leading COA#7 on Scientific knowledge, research capacity development and transfer of marine technology.

143. In Spring 2019, the UN General Assembly agreed to host the 2020 UN Conference on SDG 14 which was planned to be take place in Lisbon, Portugal in June 2020, hosted by Portugal and Kenya. The central theme of the Conference is: Scaling up Ocean Action based on science and innovation for the period 2020 to 2030: stocktaking, partnerships and solutions. The conference has been postponed due to the Covid-19 situation and no new dates have yet been announced. Prior to postponement of the conference, preparation of concept papers for a series of interactive policy dialogues had commenced. IOC convened the preparation of the concept paper for Interactive Policy Dialogue 6—Increasing scientific knowledge, research capacity and transfer of marine technology; and co-convened the preparation of the concept paper for Interactive Policy Dialogue 3—Minimizing and addressing ocean acidification, deoxygenation and ocean warming. IOC also participated in the drafting of several other concept papers.

144. Prior to the postponement of the Conference, IOC had also advanced in planning of a series of events to be held during the conference proceedings related to the Decade. This series of events would have focused on launching of the Ocean Decade Alliance and provided a space for the announcement of high-level commitments to the Decade, and it is envisaged that this event will be held during the rescheduled conference, albeit with a modified agenda.

UN Decade of Ocean Science for Sustainable Development

145. Preparation of the UN Decade of Ocean Science for Sustainable Development has continued throughout this period in a highly participatory manner. Over 1,000 stakeholders participated in 10 regional planning meetings across 9 ocean basins between June 2019 and March 2020. These meetings generated comprehensive information on the scientific research and capacity development priorities for each ocean basin, and catalyzed discussions between stakeholders regarding regional partnerships to advance implementation of the Decade. A thematic workshop was held on the role of ocean literacy in the Decade, and Decade related sessions and side events were held at international meetings and conferences including OceanObs19 and the Ocean Sciences Meeting 2020. The Commission was present at the Our Ocean Conference in Norway in October 2019 and made a Voluntary Commitment for the establishment of the Ocean Decade Alliance, which will be a key

resource mobilisation mechanism for the Decade focusing on significant voluntary commitments. The second meeting of the Decade Executive Planning Group was held in Paris in January 2020 and provided valuable input to the drafting of the Implementation Plan. A dialogue with over 25 philanthropic and corporate foundations was held in Copenhagen in February 2020 and resulted in several foundations expressing interest in establishing formal partnership agreements related to the Decade. An informal working group of over 40 Early Career Ocean Professionals was established to coordinate the engagement of this stakeholder group in the Decade, and the group met regularly throughout this period. Regular meetings were held with the UN Oceans Contact Group for the Decade throughout the period. The Second Global Planning Meeting, which was originally planned for March 2020, was cancelled due to the Covid-19 situation and was replaced by two webinars to present the Draft Implementation Plan; these webinars were attended by over 550 participants. Communications activities including a regular social media presence, use of the Decade logo in a range of approved events and publications, and a Decade newsletter have continued to raise visibility across a broad audience.

146. The key output of the preparation phase during this period was the Zero Draft Implementation Plan for the Decade, which was released to Member States, UN Oceans members, and key Decade partners for peer review in March 2020. The draft Implementation Plan explains the rationale for the UN Decade of Ocean Science for Sustainable Development and the desired state of the ocean at the end of the Decade. It contains a framework to guide the design and implementation of actions throughout the Decade including a set of scientific objectives for the Decade. It presents the criteria and process for the endorsement of Decade Actions and the principles to guide data management, capacity development, and engagement with stakeholders. Finally, it describes the proposed governance and coordination arrangements of the Decade, the mechanisms for resource mobilisation, and the process to measure progress. Peer review of the draft Implementation Plan is underway.

Biodiversity in Areas beyond National Jurisdiction (BBNJ)

147. The UN General Assembly decided in December 2017 through Resolution72/249 to organize an intergovernmental conference, scheduled over four meetings to be held over a three-year period (2018–2020) with the aim to finalise a new international legally-binding instrument (ILBI) to conserve and sustainably use marine biodiversity in areas beyond national jurisdiction (the High Seas and the Area) under the UN Convention on the Law of the Sea (UNCLOS). Negotiations would address topics identified in the package agreed in 2011, namely environmental impact assessments and area-based management tools, including the establishment of marine protected areas in areas beyond national jurisdiction. It will also provide a governance mechanism that regulates access to and benefit sharing derived from marine genetic resources. Capacity development and transfer of marine technology are also being considered to serve all its future Parties including developing countries.

148. The conference touches on areas of IOC's competency, particularly the use of the best available scientific information as the basis for management decisions and conservation policies, the application of *IOC Criteria and Guidelines for the Transfer of Marine Technology* as a guiding principle as well as the potential contribution of the Ocean Biogeographic Information System (OBIS) as an effective global platform for the sharing of research data and information. IOC took active part in the first, second and third meetings of the intergovernmental conference, held in September 2018,April 2019, and August 2019. In total, six side events have been co-organised by IOC to showcase the contribution of science to the BBNJ process.

149. A revised draft text of an agreement was released in November 2019 by the President of the intergovernmental conference. Under Article 51—Clearing House Mechanims, a reference under sub-para. 6 is made with regards to a potential role for IOC to manage such mechanims. In consultation with the IOC Officers (January 2020), IOC prepared a non-paper to describe existing and future services of the IOC that could support a future internationally legally binding instrument (ILBI) for BBNJ including coordination of a Clearing House Mechanism, as envisaged in the draft ILBI negotiation text. The Non-Paper is intended to inform on-going negotiations and will be

presented at a dedicated side event at the fourth meeting of intergovernmental conference originally planned for March 2020 but suspended due to the Covid-19 situation.

UN Framework Convention on Climate Changes (UNFCCC)

150. In the framework of the 25th Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC CoP-25) held in Madrid, Spain (2–13 December 2019), the World Meteorological Organization launched its annual report on the State of Climate. This report was produced with key contributions from IOC, via the Global Ocean Acidification Observing Network (GOA-ON) and the Global Ocean Oxygen Network (GO2NE). The report highlights that 2019 concludes a decade of exceptional global heat and high-impact weather and the Ocean—which acts as a buffer by absorbing heat and carbon dioxide—is paying a heavy price.

151. Through the engagement of the IOC Secretariat and IOC Chairperson Ariel H. Troisi, IOC participated in several events at CoP-25 such as Ocean Day at CoP-25, UN-Oceans side event, SDG 14 Community of Ocean Actions, amongst a few. One of the mandated outcomes from CoP-25 (https://unfccc.int/resource/cop25/1cop25_auv.pdf para. 31 and 33) has been a dialogue on ocean and climate change to be held under the SBSTA at the next session in June 2020. IOC was invited to submit a contribution which was sent to the UNFCCC Secretariat in April 2019.

IOC Participation in the Nairobi Work Programme (NWP)

152. During this period, the IOC collaborated with the UNFCCC and partners on ocean component of the Nairobi Work Programme (NWP). The NWP works in collaboration with partners and experts to advance activities that produce usable knowledge products and catalyse partnerships for collaborative action in a wide range of thematic areas (e.g. oceans, coastal areas, ecosystems, etc.). The NWP is currently focusing on the topic of ocean. In line with the NWP knowledge-to action methodology, key steps were undertaken to close knowledge gaps on oceans that help scale up adaptation action. A Group of Experts was convened, and a scoping paper was produced in November 2019. IOC participates in the newly created Group of Experts. A virtual Group of Expert meeting was held on 21–22 November 2019 to co-design the thirteenth Focal Point Forum as well as plan collaborative follow up actions on oceans to fill knowledge gaps. The thirteenth NWP Focal Point Forum was held under the guidance of the Chair of the SBSTA as a side event at CoP-25, 6 December 2019, Madrid, Spain. The Focal Point Forum focused on four themes: Governance and Participation; Data and Methods; Restoration and Protection; Support (Technology and Innovation, finance and funding, capacity building and education). IOC led and moderated the Data and Methods session. A report is being prepared by the UNFCCC and NWP to capture the outcomes in terms of actions as a result of the findings in the scoping paper, Group of Expert meeting as well as discussions during the thirteenth Focal Point Forum. The report will include indicative collaborative actions of engaging experts, organizations and partners. IOC will continue collaboration with the NWP, Group of Experts and partners in 2020. The NWP partnerships, based on these collaborative actions will aim at addressing the knowledge gaps on this thematic area during the course of 2020. The progress made on these partnerships will be shared with Parties at SBSTA 52 (June 2020). In addition, the NWP intends to explore possibility of co-producing relevant knowledge products in the context of these collaborative actions as well as co-presenting the outcomes in various relevant events/meeting during the course of 2020.

Convention on Biological Diversity

153. IOC is progressively increasing its involvement in the negotiation process to develop a post-2020 global biodiversity framework under the Convention on Biological Diversity. IOC has provided input to the process to define targets and indicators for the post-2020 global biodiversity framework, which includes recommendations to ensure coordination with ongoing initiatives as part of OBIS and the definition on biological and ecosystem Essential Ocean Variables (EOV) as part of GOOS.

Joint Roadmap on Marine/Maritime Spatial Planning (MSP)

154. IOC-UNESCO and the European Commission continue the implementation of the Joint Roadmap to accelerate Maritime/Marine Spatial Planning processes worldwide (#SDG OceanAction15346) as a follow-up to the 2nd International Conference on marine spatial planning (MSP) in March 2017. In the context of the MSPglobal Initiative (www.mspglobal2030.org), IOC promoted interaction amongst public and private sectors with dedicated stakeholder events and training activities. Up to 25 events were organized between July 2019 and May 2020 in Belgium, Brazil, China, Croatia, Colombia, Ecuador, France, Gabon, Italy, Latvia, Morocco, Panama, Peru, Portugal, Spain, Sweden and Turkmenistan, with more than 1,600 beneficiaries from 70 different countries. Ensuring gender, geographical and age balance was a priority in all of them, for both the invited speakers and participants.

155. MSPglobal events were organized in collaboration with national authorities and counted on the co-financing of Member States, other project initiatives led by IOC and other partner institutions. IOC considers the use of all possible languages in events a priority: during the reporting period, events were organized in Arabic, English, French, Italian, Portuguese, Russian and Spanish.

156. Additionally, the Government of the Netherlands reinforced its institutional contribution to the implementation of IOC's Capacity Development Strategy in support of the Joint Roadmap to accelerate MSP worldwide and the MSPglobal Initiative. The Government Offices of Sweden provided additional support to assist the regional implementation of the Joint Roadmap with technical workshops and trainings on integrated coastal area management, marine spatial planning and sustainable blue economy in Central Equatorial Africa and in Latin America. The Government of Turkmenistan invited our Secretariat to actively participate in the 1st Caspian Economic Forum to further discuss marine spatial planning and sustainable blue economy.

157. The Directorate-General for Maritime Affairs and Fisheries of the European Commission (DG MARE) invited the IOC Secretariat to actively participate in the Blue Partnership Forum for the Oceans to ensure the sustainable development of the ocean. The Joint Roadmap was presented as an example of cross-cutting tool to implement the Ocean Partnership in support to the implementation of the EU-China Ocean Partnership.

158. IOC and the MSPglobal Initiative supported the Regional UNESCO Office in San José (Costa Rica) during the organization of the Latin America and Caribbean Regional Partners Forum in Panama City, in particular for the session on "Opportunities for Building a Sustainable Blue Economy in the Region".

159. In the context of the collaboration between the MSPglobal Initiative and SPINCAM Project (co-funded by the Government of Flanders, Kingdom of Belgium), IOC jointly organized trainings on marine spatial planning and sustainable blue economy in the Southeast Pacific region during the second semester of 2019 in collaboration with IOC National Coordination Bodies. The initiative contributed to the regional workshop of the UN Ocean Decade 2021–2030, towards a sustainable use of marine resources in the region.

160. IOC strenghtened the collaboration with the Franco-Moroccan and Moroccan-Italian Co-Presidency of the Western Mediterranean, the Union for the Mediterranean and the Priority Action Programme/Regional Activity Centre of UN Environment for the Mediterranean with joint activities, exchanges of valuable experiences and transfer of marine knowledge.

161. The 4th MSPforum was jointly organized by DG MARE, IOC-UNESCO, VASAB Secretariat and the PanBalticScope Project in November 2019, bringing to Riga (Latvia) more than 300 experts from 50 different countries. The 5th MSPforum was expected to be organized in Athens (Greece) by the end of April 2020; however, in consultation with the Hellenic Authorities, the European Commission and IOC-UNESCO, it was postponed to September 2020.

162. The Covid-19 pandemic forced the Secretariat to cancel or to postpone a high number of events that were already agreed with our Member States and partners. The MSPglobal Initiative organized instead weekly online dialogues and thematic webinars in April and May 2020. These online events covered topics related to marine spatial planning and blue economy, including the implications of climate change in the planning process, the importance of public participation and gender, land-sea interactions and the use of remote sensing and earth observation for planning purporses, amongst other topics. These online events were alternatively organized in Arabic, English, French, Portuguese and Spanish with more than 100 registered participants per event and more than 1,000 beneficiaries from 100 different countries.

163. At national and local scales, IOC continued a productive dialogue with national authorities to increase cooperation amongst national stakeholders and experts from national institutions involved in MSP and blue economy processes. The Secretariat relied on the support of National Official Coordinating Bodies for liaison with IOC and competent authorities to jointly update the information available on the implementation status of marine spatial planning at national and regional levels. The results of this survey will effectively support the development of multilingual products, international guidance on marine spatial planning and strengthening of institutional capacity-building activities jointly organized with national authorities as well as regional and international partners.

164. The MSPglobal website is progressively integrating new content and all sections are now available in Arabic, English, French and Spanish. Guidelines and brochures are also available in Russian and Portuguese.

GEF International Waters Parnership and Large Marine Ecosystems

165. During this period, as part of the implementation of the GEF IW:LEARN project two training webinars were conducted in November 2019, one on communications and another on the various IW:LEARN Spatial Data Visualization and website tools. Peer to peer training events were implemented between the Caribbean IWECO and Pacific Ridge to Reef project, and by the Coastal Fisheries Initiative on the topic of Marine Spatial Planning. The first Central America Regional Roundtable on transboundary cooperation was conducted with 51 participants and representatives of the Ministries of Foreign Affairs and Environment (with one exception) in Tegucigalpa in July 2019. The final Southeastern Europe regional dialogue roundtable on strengthening considerations of the water-energy-food ecosystem nexus in the region’s countries was conducted in October 2019 in Tirana. The project supported a second policy-maker roundtable on transboundary cooperation in shared water basins in Central America, in February 2020 in San Pedro Sula, Honduras.

166. The project carried out the final targeted workshop for GEF IW projects in Latin America & the Caribbean in Cartagena, September 2019, with seven GEF IW projects represented and 30 participants. The project completed the online gender platform at iwlearn.net, with relevant references and materials on gender issues and policies. The project supported a GEF International Waters booth and multiple sessions in the 2019 Stockholm World Water Week and sent two projects to the UNECE IWRM Working Group meeting in October 2019 to engage in Water Convention partnerships. The project continued expanding and populating the Learning Exchange Service Center and continued to support work on the development of a freshwater security massive online open course. Training materials on benefits sharing and preparing bankable projects were prepared and disseminated. The project embarked on enhancements to its publication catalogue as well as the re-launch of its training course and materials in support of the Transboundary Diagnostic Analysis—Strategic Action Program Methodology of the GEF.

167. The 4th Phase of IW:LEARN will soon close, and a 5th phase of the project is currently being prepared through the development of project proposal that will be submitted in mid 2020 to the GEF. Consultations with project partners are ongoing to develop this proposal.

168. During this period the GEF LME:LEARN project also continued efforts to strengthen the global governance of large marine ecosystems and their coasts. The LME21 Annual Consultation Meeting held in Cartagena (Colombia) on 18–20 September 2020 had a focus on partnership building and was attended by more than 80 participants, including project representatives, as well as representatives from the private sector and international organisations and NGOs. Discussions were held around the issue how to build a successful partnerships that will result in effective achievement of the SDG 14 targets and, in a long run, result in efficient use of marine resources at the LME level.

169. Inter-project collaboration opportunities between the Benguela Current Convention and the Barcelona Convention, focusing on Marine Spatial Planning in the Benguela Current and Mediterranean Sea LMEs, and the ICO between PEMSEA and the CLME+ project focusing on creating synergies and fostering capacity on the development of blue economies for sustainable ocean governance and the achievement of the 2030 sustainable development agenda, were both completed in October 2019. In October 2019, a twinning was also completed by the Pacific Ridge to Reef project and the America Samoa EPA in Pago Pago.

170. Six toolkits related to the incorporation of knowledge into policy-making were disseminated online and the *Data and Information (DIM) Guidelines and Action Plan*, together with the LME Metadata Catalogue and a List of LME Indicators, were finalized and discussed and approved at the DIM Working Group Meeting in Paris on 2–4 July 2019. A special LME session was conducted during the Marine Regions Forum 2019, in Berlin on 30 September–2 October 2019, with the participation of three LMEs (Mediterranean, Yellow Sea and Benguela Current). The purpose of the side event was to show how the Ecosystem Based Management approach could be utilized as the basis for the LME management. Similarly, a side event was conducted during the 30th IOC Assembly showcasing the work of LMEs and their utility to help achieve the Decade. Ten policy briefs were finalized and printed and the project is assisting in publishing the definitive volume on LMEs to be published by SCOPE in collaboration with University of Rhode Island.

171. The LME:LEARN project was completed in March 2020 and the final evaluation undertaken. The new project proposal that is being developed for the 5th phase of the IW:LEARN Project incorporates a set of ongoing activities to ensure continued support for and facilitation of collaboration between LME projects.

172. The Caribbean and North Brazil Shelf Large Marine Ecosystems Project (CLME+) is UNDP/GEF project supported and implemented by the following organizations: IOC of UNESCO, CARICOM Secretariat, UN Environment, CEP, OECS Commission, OSPESCA, CRFM, FAO-WECAFC, CCAD. CLME+ Member States have been participating in the discussions and in the process towards the establishment of the Coordination Mechanism, and in the development of a Sustainable Financing Plan for Ocean Governance through a series of meetings including: The Fifth Meeting of the of the CLME+ SAP Interim Coordination Mechanism (ICM) and the CLME+ Second Regional Consultative Meeting on a Coordination Mechanism and Sustainable Financing Plan for Ocean Governance, 29 July–2 August 2019, Panama); The Sixth CLME+ SAP ICM Meeting and Project Concept Note Development Workshop (16–17 September 2019, Cartagena, Colombia); and Joint CLME+ SAP Interim Coordination Mechanism and Project Executive Group Meeting (18–20 March 2020, Miami, USA, held virtually).

Regional projects/ Activities

173. The **SPINCAM Project** (www.spincam3.net)—completed on 31 October 2019—achieved the expected milestones and deliverables agreed with beneficiary countries and the donor. At national level, SPINCAM partners maintained the linkages amongst public institutions and stakeholders in support of coastal and marine policy development and successfully strengthened the technical work in support of policy review, ecosystem processes and marine spatial pre-planning. The Project's publications on the *Compendium Of Regional Capacity Development Needs and Offers*, the *Compendium of Coastal and Marine Policies* and the report on data and information needs of users and responsible to implement marine spatial planning in the countries of the Southeast Pacific were finalized and disseminated amongst interested Member States only.

174. SPINCAM organized trainings and technical workshops in all beneficiary countries in collaboration with other project initiatives led by IOC-UNESCO and national authorities. These trainings and technical workshops were dedicated to coastal and marine ecosystems (typology, classification, uses and human impacts and valuation), regional marine policy, marine spatial planning, sustainable blue economy and marine/maritime indicators.The trainings and workshops benefited 200 officials from the region.

175. IOC-UNESCO and the Permanent Commission for the Southeast Pacific (CPPS) strengthened the collaboration with other sister projects under implementation in the region and promoted South-South and South-North exchanges, including linkages with institutions and companies based in Flanders, Belgium.

176. A three-day technical workshop on coastal vulnerability in Central Africa, organized by IOC concluded with a series of recommendations for decision-makers at national and regional levels to respond to challenges in coastal and marine environments. National representatives of Angola, Cameroon, the Democratic Republic of the Congo, Equatorial Guinea, Gabon, the Republic of the Congo and São Tomé and Príncipe met in Libreville (Gabon) on 5–7 November 2019 to start mapping out a roadmap for adapting coastal zone management strategies and action plans at national and sub-regional levels. The longer-term objective: define scenarios for sub-regional and regional synergies to address transboundary coastal vulnerability challenges, with a focus on coastal adaptation.

177. IOC was actively enaged in the organisation of Marine Regions Forum that took place from 30 September to 2 October 2019 in Berlin, organised with the support of the German Government, the European Commission, IDDRI and IASS. The overarching theme of the conference was "Achieving a healthy ocean – Regional ocean governance beyond 2020". IOC organised two sessions, respectively on: (i) the role of LMEs in advancing ecosystem-based management and SDG 14; and (ii) on the regional dimensions of the UN Decade. Both sessions came up with recommendations for strengthening regional ocean governance and science-policy interface in support of the 2030 Agenda for Sustainable Development and the UN Decade.

Work Programme of the IOC Regional Subsidiary Bodies

178. **The IOC Sub-Commission for the Western Pacific (WESTPAC)** continues to assist IOC Member States in the region to enhance their ocean governance by strengthening science-policy interface, and concerting the joint actions of research communities to address critical challenges for sustainable development. Shortly after the 30th Session of the IOC Assembly, to set the stage for actions in the region for the Decade, the Sub-Commission, in close cooperation with PICES, Japanese National Committee for IOC, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), and the University of Tokyo, organized a Regional Planning Workshop (RPW) for the North Pacific and Western Pacific Marginal Seas (Tokyo, 31 July–2 August 2019), which culminated in a wide range of actions and partnerships to advance scientific knowledge needed for sustainable development. The planning workshop received overwhelming interests with more than 160

participants from 18 countries and other UN agencies/programmes and generated invaluable input for the Decade Implementation Plan.

179. Responding to increasingly reported jellyfish blooms at coastal tourism attractions in the region, the Sub-Commission gathered researchers and emergency physicians from the region into a Harmful Jellyfish Sampling Protocol workshop (7–9 August 2019, Penang, Malaysia), aiming to understand better the blooming mechanisms and share good practices in mitigating its negative impacts. To deliver greater benefits of ocean operational services to wider stakeholders, the WESTPAC Training Workshop on "Delivering Ocean Forecasting Services for Coral Reef Conservation" (11–13 September 2019, Phuket, Thailand) wrapped up with the promise of further collaboration and data-sharing for advancing the SEAGOOS ocean forecasting system to develop early warning for coral reef bleaching. To assist IOC Member States to address plastic and microplastic pollution, the Sub-Commission enhanced Member States' capacity for research and monitoring of marine microplastics and plastics, with substantive progress presented at its 3rd Workshop on Distribution, Source, Fate and impact of marine microplastics (6–8 November 2019, Shanghai, China) including the first scientific finding published on microplastic in the Bay of Bengal. In November 2019, the Sub-Commission launched efforts to jointly research and monitor ocean deoxygenation, as reflected at its Inception Workshop on Ocean Oxygen Network (20–22 November 2019, Manila, the Philippines) held jointly with PEMSEA and the University of the Philippines.

180. Co-designed with IOC Member States in the region, WESTPAC continues to develop a regional long-term network of training and research centres (RTRCs). Over the last year the Regional Training and Research Center on Ocean Dynamics and Climate in China conducted the 9th annual international training on Climate Dynamics and Air-sea Interactions (17–28 June 2019, Qingdao, China), and the Regional Training and Research Center on Marine Biodiversity and Ecosystem Health in Indonesia on Assessment of Carbon Stock and Sequestration in Seagrass (4–12 November 2019, Bintan, Indonesia). Meanwhile, other three RTRCs, respectively on Reef Management and Restoration, Marine Toxin and Food Security, and Plastic Marine Debris and Microplastics are being setting up. Operating in the field, the Sub-Commission demonstrated its unique value for IOC in addressing its Member States' specific needs directly. For instance, WESTPAC has been assisting Viet Nam to enhance its research capacity for ocean acidification and molecular techniques with a national training workshop conducted on 22–23 October 2019, Nha Trang, Viet Nam.

181. The **IOCAFRICA Sub-Commission** organized activities to commemorate the World Oceans Day in Mombasa, Kenya (7–8 June 2019) with the African Union Commission, National Commission for UNESCO, and the Kenya Marine and Fisheries Research Institute. Activities implemented symposia, beach clean-up and beach sports. IOCAFRICA also organized an essay competition (for university students and early career scientists), focusing on the UN Decade of Ocean Science for Sustainable Development (2021–2030). Those who submitted the best entries were invited to the regional workshop on the UN Decade of Ocean Science for Sustainable Development held in Nairobi in January 2020.

182. IOCAFRICA, in collaboration with the Western Indian Ocean Marine Science Association and the UN Environment Nairobi Convention secretariat organized the Regional Workshop on the UN Decade of Ocean Science for Sustainable Development (2021–2030) to identify knowledge gaps and regional ocean science priorities in Africa and the adjacent island States. The workshop was hosted by the Kenya Marine and Fisheries Research Institute (KMFRI) on 27–29 January 2020 in Nairobi, Kenya. The workshop emphasized the need to strengthen and build upon existing mechanisms such as the regional commissions and conventions, as well as frameworks and strategies and align with the African Union's initiatives. This includes the *Agenda 2063: The Africa We Want*, which recognizes the Blue Economy as a major contributor to continental transformation and growth, and the 2050 African Integrated Marine Strategic Plan of Action (AIMS2050), which provides a roadmap for increased wealth creation from Africa's oceans and seas by developing a sustainable thriving blue economy. Capacity development was identified as a key area of concern, especially the need to improve infrastructure and facilities for research, provision of training for scientific and technical

staff, as well as translation of science to policy. This will enable the identification and bridging of major data and knowledge gaps. Other issues that were highlighted include the role of youth and job creation from the ocean economy, marine spatial planning, climate change impacts on the coastal zones, land-sea interactions and pollution, and innovative financing models for the ocean economy.

183. **The IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE)** Member States are implementing the Recommendations of their fifteenth session. In particular those initiatives for Disaster Risk Reduction and Ecosystem-based management, including: (i) IOCARIBE-GOOS establishment of a pilot project on Improvement of Hurricane Observing Forecasting Capacity; (ii) development of an operational region-wide information and forecasting system for sargassum and oil spills; and (iiI) development of a guide on best management practices for sargassum events in the coastal environment. IOCARIBE Member States, expert networks, and education and research institutions are focusing on their contribution to the UN Decade, and to the SDG 14 implementation progress and challenges. Plans for the virtual UN Decade Regional Workshop for the Western Tropical Atlantic (28–29 April 2020, Mexico City) are well underway. It is expected that the workshop will provide a major contribution to the plans of the UN Decade and identify IOCARIBE countries and territories needs and priorities in terms of transforming knowledge systems; accelerating transfer of technology; enabling training and education; fostering science-policy dialogues, and enabling scientific solutions to the region's socio-economic challenges

184. **The IOC Regional Committee for the Central Indian Ocean (IOCINDIO)** continued its efforts and mobilized additional Member States and partners to implement the IOCINDIO-VII work plans and recommendations. This was done through issuance of calls for contributions and coordinated actions enabling a reinforced IOCINDIO governance and leadership. IOCINDIO was engaged in a number of successful actions for the preparatory phase of the Decade through the participation of the IOCINDIO Chair in the Executive Planning Group of the Decade, and the organisation of major activities with significant contributions from IOCINDIO Member States, notably, the IOCINDIO Leadership Workshop on Developing a Regional Framework for Coastal Vulnerability (6–7 January 2020) that was held back to back with the Northern & Central Indian Ocean Regional Planning Workshop for the Decade in Chennai, India (8–10 January 2020). These activities attracted participants from countries including Australia, Bangladesh, India, Kuwait, Maldives, Saudi Arabia, United Kingdom, USA together with partner countries and institutions such as the South Asian Cooperative Environment Programme and South Asian Seas Programme (SACEP/SASP) and for the first time, representatives from the IOC Sub Commission for Africa and Adjacent Islands. As a result of the meetings the Indian Ocean Youth Leadership Network and the Indian Ocean Leadership Mentoring Network of Ocean, Climate and Atmospheric Sciences were established to support ocean and climate governance in the region.

185. Furthermore, in line with Decision IOC-XXX/3.3.4 “IOC Regional Committee for the Central Indian Ocean”, the Secretariat in collaboration with the IOCINDIO Officers, prepared the proposal for changing the status of IOCINDIO into an IOC Sub-Commission, describing the mission, the objectives, terms of references, budgetary implications, secretarial arrangements and necessary provisions, for consideration by Executive Council at its 53rd session.

186. IOCINDIO and the Second International Indian Ocean Expedition (IIOE-2) have developed a strong collaboration and partnership based on a co-design approach with a mutual participation in respective activities. Thus, IOCINDIO had planned a side session at the International Indian Ocean Science Conference 2020 scheduled in Goa, India, on 21–26 March 2020 (now postponed due to the Covid-19 situation). This session would have addressed: (i) the IOCINDIO Coastal Vulnerability Framework implementation at national level; (ii) the UN Decade Regional Planning Recommendations; (iii) status of the preparations of the joint IOCINDIO Coastal Vulnerability and Ocean Literacy Workshop scheduled on 26–30 August 2020 in Bangladesh. A joint Summit was also planned for the Indian Ocean Youth Leadership Network and Leadership Mentoring Network of Ocean, Climate and Atmospheric Sciences during the Conference.

Key Challenges Encountered in Implementation and Remedial Action Taken

187. In order to support sustainable management of ocean and coasts, IOC has developed a portfolio of projects that are delivering technical assistance and capacity development through regional interventions (e.g. MSP, LMEs, SPINCAM). These are generally dependent on a single donor and have set lifespans. It it therefore important to diversify the source of extra-budgetary donors and develop sustainability strategies for each of these projects. A number of coordinated strategies will contribute to this goal including increased visibility amongst potential donors of these projects, and of IOC's technical and coordination role in their implementation; development of new project concepts that build on and expand the geographic reach of the existing portfolio to new regions; enhanced links between project level activities and IOC's engagement in global policy frameworks; and an increased focus on the development of programme specific resource mobilisation strategies including a shift from a funding approach to a financing approch, including through increased engagement with the private sector.

188. In addition to the new mandate provided by the UN Decade, IOC continues to engage in a growing number of global policy frameworks relevant to the ocean: BBNJ, SDG, WOA, UNFCCC, Blue Economy, CBD, etc. IOC is planning a series of tailored policy briefs and information documents for Member States to facilitate translation of key messages from global policy frameworks and initaitives to relevant regional and national policy development.

189. The lack of additional resources made available to the IOC Secretariat to lead and coordinate the preparation phase of the UN Decade has remained a challenge over this period. While financial contributions have increased from both Member States and philanthropic foundations for the preparation phase, resources have been inadequate to fully staff a Decade preparation team and as such, Decade related activities have diverted human resources from other core activities under this function. Looking forward, if IOC continues to play a central coordination role for implementation of the Decade, there will be a need to rapidly secure long-term resources for the Decade Coordination Unit so that it can be fully staffed, thus allowing adequate investment by existing Secretariat staff in other core activities under this function.

190. The postponement of the 2020 UN Ocean Conference due to the Covid-19 situation has erased an important potential opportunity to showcase the Decade in a global forum. The Commission is developing a revised plan for events and publications related to the Decade to ensure that existing strong momentum is maintained in the lead-up to the Decade start in January 2021.

191. Regional subisdiary bodies (RSBs) serve as a key arm of IOC in regions, translating the broad spectrum of IOC global objectives into concrete actions at regional and national level. Each of these are staffed with one single IOC professional. This persistent understaffing situation is indeed difficult for RSBs to deliver on the unprecedented demands of IOC Member States.

FUNCTION F: CAPACITY DEVELOPMENT
Develop the institutional capacity in all of the functions above, as a cross-cutting function

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IOC Capacity Development Strategy

192. The IOC Assembly adopted the *IOC Capacity Development (CD) Strategy, 2014–2021* through Resolution XXVIII-2 and agreed that the IOC global and regional programmes should develop programmatic and regionally relevant capacity development workplans based on that strategy and related needs assessments conducted in a consistent manner, building on ongoing activities and making use of existing training and education facilities. At the first session of the Group of Experts (2018) it was decided to establish two task teams: one on CD requirements of Member States

(with special attention to SIDS), and one on the implementation of the Transfer of Marine Technology/Clearing House Mechanism “portal”.

193. As a follow up, a project proposal (August 2019) was successfully submitted to the Government of Flanders/Belgium (FUST) for funding. It is entitled “The IOC Ocean InfoHub: development of an IOC CHM/TMT powered by a proof-of-concept ODIS architecture” which will, *inter alia*, “*establish and anchor a network of regional and thematic nodes that will contribute to the transfer of marine technology (TMT) by enhancing shared scientific and technical capacities to render a wide range of data and information products and services”.* Reference is made to Function B for more information on this project. The project implementation started on 1 April 2020. It is noted that due to Covid-19 the face-to-face global and regional start-up meetings are being replaced by online meetings.

194. Through IOC Circular Letter 2793 (27 January 2020), Member States were invited to designate national IOC focal points for capacity devvelopment. This resulted in 23 additional focal points (March 2020) bringing the total to 31.

IODE’s OceanTeacher Global Academy

195. Between 2015 and 2019 the IODE OceanTeacher Global Academy Project has established a global network of Regional Training Centres (RTCs) to deliver customized training for ocean experts and practitioners and to increase national and regional capacity in coastal and marine knowledge and management. OTGA currently has six designated RTCs (in Belgium, Colombia, Kenya, Mozambique, India and Malaysia) and two candidate RTCs (China and Iran). The RTC in Senegal was not active during this reporting period. During the past intersessional period, OTGA organized 12 face-to-face training courses at the 8 RTCs, involving 345 participants. Courses focused on a range of topics related to IOC programmes, contributing to the sustainable management of oceans and coastal areas worldwide, and relevant to Member States in the regions. Four different languages (English, Spanish, French and Portuguese) were used during the different training courses and workshops depending on venue, and all training resources were hosted by the OceanTeacher e-Learning Platform (www.oceanteacher.org). By April 2020, over 6,600 users had registered on the e-Learning Platform.

196. Additionally, during the reporting period, OceanTeacher supported the organization of another five training courses, involving close to 250 participants (International training course on "Instrumenting our ocean for better observation: a training course on a suite of biogeochemical sensors"; 2nd SeaDataCloud Training Course; IOC/HAB International Phytoplankton Intercomparison (IPI): IOC/HAB Training Course: Certification on Identification of Harmful Marine Algae; NF-POGO Centre of Excellence: Ocean Data Management; Marine biodiversity in rocky shores: Biological Essential Ocean Variables (EOVs) for the analysis of marine biodiversity patterns in rocky shores).

197. It is important to recall that in 2018, the IOC Project Office for IODE, host of the OceanTeacher Global Academy, achieved ISO 29990 certification as a Learning Services Provider for non-formal education and training and was accredited by the Belgian Accreditation Body (BELAC) having satisfied the requirements of the International Standard. This certification is a recognition of the quality of learning opportunities offered by OTGA, through the IOC Project Office for IODE, and the high standard of quality learning services delivered that can support all IOC programmes in providing specialized training. The certification has been renewed in 2020.

Ocean literacy

198. The voluntary commitment “Ocean Literacy for All” coordinated by the IOC was announced at the first UN Ocean Conference (New York, June 2017). The implementation of the voluntary commitment started in August 2017, and was completed in December 2019 thanks to the support of the Swedish Government. In July 2018, the IOC Ocean Literacy Portal was launched to serve as a repository for quality education and information tools, resources, good practices and local or international success stories. The main function of the portal is to share resources on ocean topics and for different potential end-users, i.e. educators, scientists, policy-makers, private sector and media. Furthermore, an internal platform, using the UNESTEAM community of practice portal, was created to develop discussion forums, and to facilitate the collaboration of international ocean literacy experts.

199. In 2018 a partnership was established with the Ocean Frontier Institute, the Dalhousie University and the National Film Board of Canada to develp a feasibility study for the internationalization of the Ocean School Programme. Ocean School is an ocean science educational programme, which uses storytelling techniques, immersive technologies and interactive media to promulgate ocean literacy. An Ocean School Teacher Training Workshop was organized in San José, Costa Rica (3–4 December 2018), in collaboration with the UNESCO Office, to test the possibility of adapting the Ocean School programme and technology to different educational systems and geographical and cultural contexts.

200. In November 2018 the First Ocean Literacy for multi-stakeholder processes in Ocean Governance workshop was organized in Paris at UNESCO HQ. Ocean Literacy experts, journalists, researchers, foundations, MSP practitioners, educators, representatives of NGOs and public authorities participated in the workshop with the aim of discussing the most effective ways to communicate ocean knowledge to different audiences, and to share best practices and innovative views on the challenges of transforming knowledge into action, using Ocean Literacy tools.The event represented a bridge between the “Ocean Literacy for All” and the “MSP Global”. Between 2018 and 2019 a pilot test phase of the *Ocean Literacy for All: A Toolkit* started in collaboration with the UNESCO Network of Associated Schools (ASPNet). The toolkit is meant to provide educators and learners with innovative tools, methods and resources to understand ocean processes and functions, to alert them on the most urgent ocean issues and to provide ready to use activities to be implemented in formal and non-formal educational contexts. The toolkit was tested in schools of 36 countries, and a questionnaire was administrated to the teachers for its evaluation. The results of the questionnaire showed that 84,5% of the teachers would recommend the toolkit for their peers, and the 64,7% would use the toolkit regularly for their lectures. A clear recommendation from the teachers was to develop more educational resources for primary school students.

201. In 2019, two main activities were implemented: one related to the development of a proposal for an Ocean Literacy Strategy for the UN Decade of Ocean Science; and the second one to development a pilot ocean literacy professional development workshop for the private sector. The process has involved a series of stakeholder consultations, including an open questionnaire with over 300 respondents from across the world, a participatory multi-stakeholder workshop as well as bibliographical review. The workshop held in Venice in December 2019, was attended by 37 people from 34 countries. As a result of the workshop a set of recommendations to further develop the strategy were put forward. First of all, a statement on vision was proposed, as follows: “Enable and scale up action in all sectors of society regarding Ocean sustainability, in order to accelerate a fundamental shift in the way our ocean is managed’. Furthermore, for strategic purposes, it was proposed to focus the ocean literacy strategy on four Priority Areas, namely: Advancing Policy, Formal Education, Corporate Action and Community Engagement. The ocean literacy professional development workshop was held in Venice on 16–17 December 2019 was attended by 15 people coming from 12 countries. The course included an expert panel with representatives of media, finance, science and NGOs. It presented some good practices of businesses that have transformed their activities towards ocean sustainability and the implementation of the Sustainable Development Goals.

Global Ocean Science Report

The second edition of GOSR

202. The work on the second edition of GOSR ("GOSR2020") has progressed well. As GOSR2020 was originally intended to be launched at the 2nd UN Ocean Conference in Lisbon in June 2020, which has been postponed, the Secretariat is exploring options for an adequate high level opportunity to launch of the Report. The specific modalities of the launch may also depend on the evolution of the Covid-19 pandemic and, therefore, the possibility of a virtual launch of the report is not excluded.

203. In addition to primary data from IOC Member States and other governments, GOSR2020 benefits from bibliometrics analysis related to scientific production globally (already reflected in the first edition of the GOSR) as well as of a technometrics analysis of patents in ocean science, also at the global level. Such a comprehensive analysis of patents in ocean science constitutes a precedent in the area of ocean R&D and should be of particular use to Member States in assessing the contribution of ocean science to sustainable blue economies.

204. It is worth recollecting that the *Global Ocean Science Report* provides information on status and trends of ocean science worldwide in terms of infrastructure, human resources (using sex-disaggregated data), and level of investments (the latter calculated as the ocean science proportion of the R&D expenditures in the national envelope). GOSR is, therefore, envisioned to guide strategic investments in ocean science in support of national sustainable development agendas. The report is also the main mechanism to report on progress on SDG Indicator 14.a.1, for which IOC is custodian agency (cf. Function D). *GOSR2020* will also provide a baseline in relation to ocean science capacity for the UN Decade of Ocean Science for Sustainable Development (2021–2030).

205. The IOC Assembly at its 28th session (Paris 18–25 June 2015) through Decision XXVII/5.1, added the publication of the GOSR and its activities as part of the IOC regular programme of work. The first edition of GOSR was published in 2017.

206. The Editorial Board of *GOSR2020*, composed of 12 members with adequate discipline, geographic and gender balance, has provided the oversight function needed to ensure the scoping of the report, quality assurance and control over its development and finalization, and continuity and renewal between the first and second editions. *GOSR2020* includes 8 chapters, as follows: 1. Introduction; 2. Definitions, data collection and analyses; 3. Ocean science funding; 4. Research capacity and infrastructure; 5. Data and information; 6. Research productivity and science impact; 7. Implications and applications of ocean science for sustainable development; 8. Conclusions and recommendations.

207. Particular attention was given to the peer-review of *GOSR2020*, which has seen the contribution of many scholars and expert practitioners in all regions of the world, and has followed a rigorous procedure in terms of confidentiality; provision of structured comments related to the structure of the report and the comprehensiveness of the findings in individual chapters and of the report as a whole as well as of the related analysis; overlaps, inconsistencies and gaps in the assessment within or across different chapters; proposed revisions, providing supporting evidence from the literature; relevant additional scientific articles; suggestions on improving the presentation of material graphically or through tables.

208. *GOSR2020* will be published online as well as in a limited number of printed copies and will be complemented by the *GOSR2020* portal. The portal will allow for open access to all data underpinning *GOSR2020* and will also publish the comments received following individual reviews, in an IPCC style.

Assessing the impacts of the Covid-19 pandemic on ocean science

209. The *Global Ocean Science Report* measures, in a systematic manner, investments in ocean science (human resources, infrastructure such as research vessels and laboratories) as a proportion of national R&D envelopes. Trends in scientific production, including through international scientific collaborations, and in the transfer of research findings to the application sectors (via patents and their licensing) are also measured by the GOSR. It is important to assess the impacts of the Covid-19 pandemic on such strategic investments in relation to the 2030 Agenda.

210. For this purpose, and in the context of the UNESCO-wide response to the Covid-19 pandemic, the IOC Secretariat will lead a complementary study to *GOSR2020* to assess how the Covid-19 crisis may have led to the shifting of funding and support more in general from ocean science towards other branches of science/economic sectors e.g. health. The study will also allow to foresee the related impact on the achievement of SDG Target 14.a on ocean science capacity and the transfer of marine technology, and will suggest options to mitigate risks related to undershooting efforts supporting the realization of the target, and to maximize the contribution of ocean science to the 2030 Sustainable Development Agenda, including through the production of research findings for developing applications for health (SDG 3), and also in relation to food security (SDG 2). The study will contain a communication element demonstrating the relevance of ocean science and, specifically, the work coordinated by IOC, to the knowledge base for health applications.

IOC Regional Subsidiary Bodies

IOCAFRICA

211. Capacity Development continues to be a key focus for **IOCAFRICA**, with regional training centres for the OceanTeacher Global Academy established at the Kenya Marine and Fisheries Research Institute – (Mombasa, Kenya), Eduardo Mondane University (Maputo, Mozambique) and the Centre de Recherches Océanographiques de Dakar-Thiaroye CRODT/ISRA (Dakar, Senegal) hosting training courses on a wide range of topics. During the reporting period training courses were held on Discovery Operational Oceanography Data Products and Services/Descoberta e Uso de Produtos e Serviços de Dados de Oceanografia Operacional (held jointly between RTC Kenya and RTC Mozambique, 29 July–2 August 2019) and Marine GIS Applications (RTC Kenya, 28 October–1 November 2019).

212. IOCAFRICA has developed linkages with other organizations working in the region such as WIOMSA and the secretariats of the UN Environment regional conventions in order to benefit from synergies. Four postgraduate students from Madagascar were supported to participate in conferences in the period November–December 2019 in Seychelles, Egypt and Spain and present the results of the work undertaken for their dissertations.

IOCARIBE

213. The IOC capacity development strategy has long been a major element of IOCARIBE's programmes and activities. **IOCARIBE** has a series of delivery mechanisms used for achieving its capacity development, among them IOCARIBE Strategic Sciences Plan (2017–2026), a draft capacity development strategy; a number of programmes and projects such as IOCARIBE-GOOS, CARIBE-EWS, ODINCARSA, CLME, OTGA, HAB-ANCA. Also, IOCARIBE works with a number of partner organizations such as WMO, UNEP, UN-DOALOS, IAEA, FAO, the European Commission, regional organizations and NGOs. Universities and research institutions have been important partners. Strong focus during this reporting period continues to be on Disaster Risk Reduction, Ecosystem Based Management, and Marine Spatial Planning.

214. *The IOCARIBE Medium Term Strategic Science Plan (2017–2026)* objectives are to: (i) support strategic planning of IOCARIBE Member States in relation to the development of marine sciences, oceanic observations and associated services; (ii) facilitate a coherent management of regional programmes related to the marine-coastal environment and its resources; and (iii)

strengthen scientific basis supporting regional programmes. IOCARIBE SSP Lines of Action are: (i) oceans and climate; (ii) ocean science, technology and sustainable use of coastal and ocean resources with special emphasis on large marine ecosystems and integrated coastal area management; (iii) and extreme natural hazards.

215. The Sub-Commission has been working in the implementation of capacity development recommendations and their main Outcome "Strengthening IOCARIBE Member States capacity for a sustainable use of ocean and coastal resources and an increased resilience to climate change." Twenty-five Member States adopted the IOCARIBE Medium Term Strategic Science Plan (2017–2026) as the basis for developing IOCARIBE capacity development work plan, whose objectives are to: (i) support strategic planning of IOCARIBE Member States in relation to the development of marine sciences, oceanic observations and associated services; (ii) facilitate a coherent management of regional programmes related to the marine-coastal environment and its resources; and (iii) strengthen scientific basis supporting regional programmes.

216. The IOCARIBE region has been increasing its capabilities in the marine sciences in recent years. Governmental structures have also been strengthened. The inventory of higher education institutions identified 141 academic higher education institutions in the Americas that offer 777 Ocean sciences programmes. However, 70% of that capacity is concentrated in only five Latin American countries and USA. The major challenge in the ocean sciences is the asymmetrical development and capacity of Member States, and Member States low funding for ocean sciences and research.

217. IOCARIBE, IODE, CARIBE-EWS and the Marine Policy and Regional Coordination Section have carried out a series of training courses during the period June 2019–May 2020 in the region. Particularly at the OTGA Regional Training Center INVEMAR in Santa Marta, Colombia: (i) Curso de Tecnologías de la información (SIG) Aplicado al Medio Marino y Costero, 22–26 July 2019, (ii) Sistemas de Carbonatos, 21–25 Oct 2019, (iii) Áreas Marinas Protegidas, 18–22 Nov 2019 and (iv) Cambio Climatico: Carbono Azul y adaptación basada en ecosistemas marinos y costeros, 20–24 April 2020 (postponed due to Covid-19); also (v) strengthening early warning and response capacities for tsunami and other coastal hazards in Central America, 17–19 September 2019; and (vi) Marine Spatial Planning in the Scope of the Sustainable Blue Economy, 1–3 October 2019.

218. Within the cooperation with the IHO Meso-American Caribbean Hydrographic Commission (MACHC), IOCARIBE and MACHC have identified respective capacity development training offerings for 2020 and 2021 and considered co-sponsoring those of common interest to avoid duplication of effort and maximize impact. Also, they are exploring, as a part of their contribution to SEABED 2030, sharing, delivery and management of marine spatial data holdings through pilot projects with partners such as the IOC/IODE and the IOCARIBE Caribbean Marine Atlas.

219. The UN Decade of Ocean Science Regional virtual Workshop for the Western Tropical Atlantic, 28–29 April 2020, provided a regional contribution to the UN Decade with a focus on IOCARIBE countries' and territories' needs and priorities in terms of transforming knowledge systems; accelerating transfer of technology; enabling training and education; fostering science-policy dialogues, and enabling scientific solutions to the Region's socio-economic challenges.

WESTPAC

220. **WESTPAC** continues to implement the *IOC Capacity Development Strategy (2015–2021)*, and fulfils, in the context of the United Nations Ocean Conference, its voluntary commitment to "develop research capacity and transfer marine technology through the UNESCO/IOC Regional Network of Training and Research Centres (RTRCs) on Marine Science in the Western Pacific and adjacent regions". Over the last year the Regional Training and Research Center on Ocean Dynamics and Climate in China conducted the 9th annual international training on Climate Dynamics and Air-sea Interactions (17–28 June 2019, Qingdao, China), and the Regional Training and Research Center on Marine Biodiversity and Ecosystem Health in Indonesia on Assessment of Carbon Stock

and Sequestration in Seagrass (4–12 Nov 2019, Bintan, Indonesia). Meanwhile, other three RTRCs, respectively on Reef Management and Restoration, Marine Toxin and Food Security, and Plastic Marine Debris and Microplastics are being setting up. Co-designed with Member States in the region, the RTRC initiative has been recognized as one of best practices at the UN Decade Regional Planning Workshop for the North Pacific and Western Pacific Marginal Seas (31 July–2 August 2019, Tokyo), and expected to make further contribution to the UN Decade of Ocean Science.

221. Operating in the field, the Sub-Commission demonstrated its unique value for IOC in addressing its Member States' specific needs directly. For instance, WESTPAC has been assisting Viet Nam to enhance its research capacity for ocean acidification and molecular techniques with a national training workshop conducted on 22–23 October 2019, Nha Trang. To improve the regional and national capacity for molecular techniques for resources management and biodiversity conservation, in late 2019 the Sub-Commission kicked off the third phase of a UNESCO/Korean Funds in Trust project "Enhance the Capacity for Species Identification and Genetic Analysis on Marine Organisms in the Coral Reef Ecosystems in the Western Pacific". In addition, WESTPAC also started in June 2019 the implementation of another UNESCO/Japanese Funds-in-Trust project aiming to accelerate the transfer of marine technology for marine biodiversity conservation and seafood safety, particularly on harmful algal blooms, coastal habitat conservation, marine toxins and seafood safety, and other hotspot biodiversity related issues, such as the impact of ocean acidification and climate change, and microplastics, etc.

222. Two OTGA regional training centres have been established in Malaysia and China to provide training courses for the region. During the reporting period one training course was held on Discovery and Use of Operational Ocean Data Products and Services (RTC Malaysia, 22–26 September 2019).

IOCINDIO

223. The **IOCINDIO** work plan was endorsed by Assembly Decision IOC-XXX/3.3.4 at its 30th session. The IOCINDIO uses a crosscutting approach with on-job training through research for a long-term capacity development which is based on a regional self-driven, ownership and leadership approach. Thus, each IOCINDIO project proposal of the work plan incorporates capacity development component (Ref. IOCINDIO-VII/3s) as opposed to a stand-alone approach. IOCINDIO Member States significantly invest their own national resources enabling world class national ocean sciences, technology and innovation Institutes, universities and research centres which lead and drive the capacity development needs and priorities in the region. It is in this context that the National Institute of Ocean Technology in Chennai, India, successfully supported and hosted the IOCINDIO Leadership workshop on regional Framework for Coastal Vulnerability, 6–7 January 2020.

224. During the reporting period, IOCINDIO Officers and the IOC Secretariat pursued mobilization and support of additional Member States and partners for implementing the IOCINDIO networking research infrastructures, facilities and human resources.

UNESCO Category 2 Centres

225. In the IOCINDIO region, there are two UNESCO Category 2 Centres which are operational and significantly contribute to the endogenous capacity development, namely, the Regional and Research Centre on Oceanography for West Asia in the Islamic Republic of Iran and the International Training Centre on Operational Oceanography at the Indian National Centre for Ocean Information Services (INCOIS). Their reports are available as document IOC/INF-1386.

226. Two OTGA Regional Training Centres have been established in India (INCOIS) and IR Iran (INIOAS) to provide training courses for the region. Four training courses were held during the reporting period: Discovery and Use of Operational Ocean Data Products and Services (RTC India, 1–

5 July 2019), Coastal Vulnerability Mapping and analysis using QGIS (RTC India, 26–30 August 2019), Remote Sensing of Coral Reefs (RTC Iran, 20–23 October 2019), and Ocean Colour Remote Sensing – Data, Processing and Applications (RTC India, 25–29 November 2019).

Key Challenges Encountered in Implementation and Remedial Action Taken

227. Staffing allocated to central capacity development coordination is currently only 0.2 FTE. This is insufficient to reach the ambitions of IOC in terms of implementation of the CD strategy and reaching IOC's full potential. Similarly the secretariats of the regional subsidiary bodies are understaffed and under-resourced. The part-time Secretariat for IOCINDIO remains a critical challenge for the full realisation of the Committee's potential. Secondments/loans of personnel from Member States are being actively sought to support the work of all regional subsidiary bodies.