



Proceedings of the PNLC Regional Workshop: From Knowledge to Action ~ Scaling Blue Carbon Initiatives in the East Asian Region

25-26 March 2026
Antipolo, Philippines

INTRODUCTION

- i. The Regional Workshop entitled “PNLC Regional Workshop: From Knowledge to Action: Scaling Blue Carbon Initiatives in the East Asian Region” was hosted by the PEMSEA Network of Learning Centers (PNLC) and held in Antipolo, Philippines, from 25–26 March 2026.
- ii. The workshop brought together 43 participants including experts, speakers, and representatives from PNLC member institutions from 8 countries across the region, namely Cambodia, China, Lao PDR, Indonesia, the Philippines, Thailand, Timor-Leste, and Vietnam.
- iii. The activity was co-sponsored by the Luce Foundation, University of Hawai’i, University of the Philippines–Marine Science Institute, the Ministry of Environment Indonesia, and the PNLC.
- iv. The organization of the workshop was led by the PNLC Secretariat in coordination with the PEMSEA Resource Facility, ensuring effective program delivery and stakeholder engagement.
- v. Detailed information on the workshop agenda and the list of participants are provided in Annex 1 and Annex 2, respectively. Links to the presentations and photos are provided in Annexes 3 and 4.

OPENING CEREMONY

- 1.1 On behalf of the PEMSEA Resource Facility (PRF), Executive Director **Ms. Aimee Gonzales** opened the ceremony by warmly welcoming all participants to the Philippines and expressing appreciation for the continued collaboration among partners, including the University of Hawai’i, PNLC, and PRF. She highlighted the increasing vulnerability of coastal regions in the East Asian Seas, particularly in the context of typhoons, flooding, and climate-related risks, underscoring the critical role of blue carbon ecosystems in mitigating these impacts and enhancing coastal resilience. Ms. Gonzales also outlined several key challenges in advancing blue carbon initiatives, including gaps between science and policy, fragmented governance structures, limited integration of economic valuation, and the need for stronger and more sustained data systems. To address these systemic issues, she emphasized the importance of strengthening science-to-policy translation, promoting long-term research and monitoring, enhancing monitoring and evaluation frameworks, and investing in capacity development, particularly for the next generation of practitioners. She further stressed the need to scale up blue carbon initiatives from isolated pilot efforts into broader, integrated practices that support stronger communities and healthier ecosystems. She concluded by wishing participants a productive discussion and encouraging continued collaboration in the upcoming PNLC General Assembly.
- 1.2 **Prof. Dr. Yonvitner**, President of the PNLC, opened the session by warmly welcoming participants and expressing his appreciation for the continued collaboration since the 2023 General Assembly in Seoul. He emphasized several key messages. First, he highlighted the strategic importance of blue carbon in the East Asian region, which hosts a significant proportion of global blue carbon ecosystems, making regional collaboration essential for climate change adaptation. Second, he underlined the need for a systematic and coordinated approach in developing blue carbon assessment methodologies, building on ongoing efforts initiated through PNLC and PEMSEA. Third, he stressed the importance of consolidating and refining methodologies through collaboration among partners, including academic institutions

such as the University of Hawai'i, while also engaging youth and the next generation in capacity development. Fourth, he noted that the workshop serves as a platform to strengthen knowledge, enhance capacity, and support local governments in implementing blue carbon initiatives. Finally, he encouraged participants to share their practical experiences in working with local governments and to explore strategies for translating knowledge into actionable policies and practices at the local level. He concluded by expressing his gratitude to all speakers and participants for their valuable contributions to the workshop.

- 1.3 **Dr. Brian Szuster** from the University of Hawai'i delivered the opening remarks of the session, setting the tone for collaborative discussions and knowledge exchange among participants. He emphasized the importance of strengthening regional cooperation to address complex coastal and marine challenges, particularly in advancing blue carbon initiatives in the East Asian Seas region. He highlighted that effective solutions require the integration of science, policy, and practice, supported by active participation from diverse stakeholders. Dr. Szuster also encouraged participants to openly share their experiences, insights, and lessons learned, fostering an inclusive and constructive dialogue. He concluded by underscoring the value of collective action and partnership in translating knowledge into practical and impactful outcomes for sustainable coastal and marine management.

- 1.4 **Ms. Isdahartati**, representing the PNLC Secretariat, provided an overview of the workshop, outlining its objectives, structure, and expected outcomes while facilitating the introduction of participants and resource persons. She emphasized that the workshop, themed "From Knowledge to Action: Scaling Blue Carbon Initiatives in the East Asian Region," is designed to bridge the gap between scientific knowledge and practical implementation. The program is structured into two main components—Knowledge (Day 1) and Action (Day 2)—combining expert presentations, group discussions, and collaborative exercises to foster learning and co-development of solutions. The objectives of the workshop include strengthening regional understanding of blue carbon science, promoting collaboration among PNLC members and partners, and identifying actionable strategies to support blue carbon initiatives at national and local levels. She also highlighted the importance of active participation, knowledge exchange, and cross-country learning in achieving the workshop's goals. The session concluded with the introduction of participants and speakers, creating an inclusive platform for engagement and setting clear expectations for productive discussions throughout the workshop.

SUMMARY REPORT OF THE SPEAKERS (Day 1)

- 2.1 **Prof. Brian Szuster**, University of Hawai'i, served as the moderator for Sessions 1–4, guiding a series of presentations on the global and regional development of blue carbon. Session 1, Global/Regional Status and Directions of Blue Carbon: International Guidelines and Institutional Mechanisms, was presented by Dr. Severino Salmo (University of the Philippines). Session 2, Global/Regional Status and Directions of Blue Carbon: Status of Blue Carbon Science, was delivered by Dr. Maria Lourdes San Diego-McGlone (University of the Philippines–Marine Science Institute). Session 3, Global/Regional Status and Directions of Blue Carbon: Status of Blue Carbon Supply and Market Mechanisms, was presented by Dr. Michael Abundo (OceanPixel). Session 4, PEMSEA Blue Carbon Ecosystem Services Management Mechanism and Regional Blue Carbon Accounting Protocol, was delivered by Ms. Kristina Di Ticman (PEMSEA).

- 2.2 **Dr. Severino Salmo** from the University of the Philippines presented an overview of the global and regional status of blue carbon, highlighting key developments, challenges, and strategic directions under the International Blue Carbon Scientific Working Group (IBCSWG). He emphasized the growing global relevance of blue carbon in climate mitigation, particularly in supporting Nationally Determined Contributions (NDCs), and referenced key guidance documents such as “Coastal Blue Carbon: Methods for Assessing Carbon Stocks and Emissions Factors in Mangroves, Tidal Salt Marshes, and Seagrass Meadows” and the “ASEAN Blue Carbon and Finance Profiling” report. At the regional level, Southeast Asia—particularly Indonesia was identified as having the largest extent of mangrove and seagrass ecosystems, while the Philippines exhibits high variability in carbon stock estimates, highlighting the need for standardized methodologies and more robust empirical data. Key scientific gaps include limited data on carbon stocks, sequestration rates, and CO₂ emissions, as well as uncertainties influenced by biogeography and geomorphology. The presentation also addressed critical considerations in blue carbon financing, particularly the balance between carbon stocks and sequestration rates, and the concepts of permanence (conservation) and additionality (restoration), noting that not all areas are suitable for restoration due to ecological and socio-economic constraints. Institutional challenges include the need to standardize methodologies, strengthen technical capacity, prioritize sites based on permanence and additionality, and improve monitoring systems. Dr. Salmo highlighted emerging tools such as the Philippines’ BlueCarT (Blue Carbon Tracker) and emphasized the importance of developing national blue carbon roadmaps, enhancing financing mechanisms, and advancing comprehensive blue carbon assessments to support scalable and effective implementation.
- 2.3 **Dr. Maria Lourdes San Diego-McGlone** from the University of the Philippines–Marine Science Institute presented on “*Status of Blue Carbon Science.*” She began by defining blue carbon as organic carbon captured and stored by coastal vegetated ecosystems such as mangroves, seagrasses, and salt marshes, emphasizing their critical role in climate change mitigation. She highlighted that these ecosystems have significantly higher carbon sequestration capacity than terrestrial forests due to their ability to store carbon in sediments over long periods. Despite covering only a small fraction of ocean areas, blue carbon ecosystems contribute substantially to global carbon burial while also providing co-benefits such as coastal protection, biodiversity support, water quality improvement, and fisheries enhancement. She outlined key threats to blue carbon ecosystems, including land-use change, coastal development, climate change, and physical disturbances, which have contributed to their global decline. The presentation noted that blue carbon science has grown rapidly since 2009; however, research remains uneven, with mangroves more widely studied than seagrasses and many studies concentrated in limited regions. In the Philippines, research efforts are still relatively limited and largely supported by international funding, indicating the need for stronger national investment. Dr. McGlone emphasized that blue carbon science is inherently multidisciplinary, integrating ecological, biogeochemical, technological, and socio-economic perspectives. She also highlighted the role of emerging technologies such as remote sensing and GIS in improving ecosystem monitoring. However, key challenges remain, including limited data availability, lack of standardized methodologies, and uncertainties in carbon estimates particularly for seagrass ecosystems. She concluded by stressing the need for standardized assessment methods, improved data systems, stronger policy integration, and sustainable financing mechanisms to advance scalable and effective blue carbon initiatives.
- 2.4 In his presentation titled “Global/Regional Status and Directions of Blue Carbon: Supply and

Market Mechanisms,” **Dr. Michael Lochinvar Sim Abundo** (OceanPixel) provided a comprehensive overview of the emerging blue carbon market ecosystem and its role in supporting climate action and blue economy development. He emphasized that while blue carbon holds significant potential, relying solely on carbon credit revenues remains risky, and therefore an integrated approach combining blue carbon with broader ecosystem services and blue economy sectors is essential. He also introduced key insights from the Blue Carbon Handbook, highlighting that blue carbon ecosystems are valuable natural assets that capture and store carbon dioxide, contributing significantly to climate change mitigation, while also delivering critical ecosystem services. In addition, he discussed trends in market-based blue carbon projects, including the growing participation of diverse actors such as governments, private sector investors, and development partners, as well as the importance of establishing clear project governance frameworks to ensure transparency, accountability, and long-term sustainability. He further highlighted key market signals indicating increasing investor interest, particularly aligned with ESG (Environmental, Social, and Governance) priorities, but noted persistent challenges such as limited awareness, unclear feasibility, regulatory uncertainty, and risks of greenwashing. Dr. Abundo stressed the importance of standardizing natural capital valuation and adopting natural capital accounting to enhance credibility and attract investment, alongside the use of financial instruments such as guarantees and insurance to improve project bankability. He underscored that successful blue carbon projects must be socially inclusive, involve private sector participation from the outset, and ensure that benefits—both carbon and co-benefits—outweigh alternative land uses. Through examples such as integrated blue economy cluster development and pilot projects in Berau Regency, Indonesia, he illustrated the potential of multi-sectoral approaches that combine conservation, restoration, and livelihood development. The presentation concluded by emphasizing key lessons, including the need for long-term investment perspectives, scaling up pilot initiatives, leveraging technology for improved carbon assessment, and strengthening collaboration among governments, communities, private sector, and international partners to unlock the full potential of blue carbon markets and sustainable coastal development.

- 2.5 **Ms. Kristina Di Ticman** (PEMSEA Resource Facility) presented on “*PEMSEA Blue Carbon Ecosystem Services Management Mechanism and the Regional Blue Carbon Accounting Protocol.*” She emphasized the transition from methodology development to practical implementation of blue carbon initiatives across the region. The presentation highlighted that a harmonized regional blue carbon methodology has already been established, aligned with existing national standards and consistent with IPCC guidance and carbon market frameworks. However, she noted that despite the availability of these standards, their application remains uneven due to limited technical capacity, inconsistent implementation across sites, and barriers in project development. To address these gaps, she underscored the critical role of the PEMSEA Network of Learning Centers (PNLC) as regional hubs for delivering technical training, supporting standardized application of methodologies, and providing assistance in project development and implementation. Ms. Ticman further elaborated on the technical capacity requirements needed for effective implementation, including field measurement, laboratory analysis, data management, and spatial analysis. Developing blue carbon facilities in learning centers, which may include field equipment, laboratory infrastructure, data workstations, and environmental monitoring stations to support standardized and long-term implementation, should also be explored. She introduced a tiered capacity system (Tier 1–3), allowing learning centers to progressively build capabilities, as well as a distributed capacity model where institutions can specialize and share resources across the network. The presentation also outlined a structured training program covering core modules such as fundamentals, field measurement, data analysis, project development, and advanced monitoring approaches, directly linked to the methodology’s technical annexes.

She explained that the training delivery will adopt a scalable approach through training-of-trainers (ToT), combining online and in-person learning. The session concluded with an implementation roadmap consisting of preparation, pilot testing, capacity expansion, and regional scaling-up, emphasizing that strong capacity building and institutional collaboration are essential to ensure consistent application of blue carbon standards and to support the development of credible and scalable blue carbon projects in the region.

SUMMARY OF PRIORITY PROGRAMS AND ACTIVITIES OF PNLC MEMBERS RELEVANT TO THE NETWORK

- 3.1 **Mr. Phat Chandara** from the Royal University of Phnom Penh (RUPP) presented on “RUPP’s Current Research-Oriented and Development Programs.” He began by outlining RUPP’s vision to become Cambodia’s flagship university with strong regional standing in education, research, innovation, and social engagement by 2030. The presentation highlighted the university’s commitment to strengthening research capacity through the development of research infrastructure, establishment of research centers and laboratories, and enhancement of research management systems. Key efforts include improving access to scientific literature, strengthening ICT infrastructure, promoting innovation and entrepreneurship, and building human capacity through training in research skills and PhD supervision. Mr. Chandara also emphasized the importance of international collaboration and joint research initiatives to improve the quality of graduate programs and expand research impact. He presented several ongoing academic and research programs related to marine and coastal context, including master’s degrees in Biodiversity Conservation, Climate Change, Development Studies, Family Business Management, Biology and Tourism Management, as well as the establishment of an Integrated Coastal Management (ICM) Learning Center under the Department of Natural Resource Management and Development. The presentation further showcased RUPP’s contributions to coastal and blue carbon research, including initiatives on coastal habitat mapping, remote sensing for carbon storage assessment, ecosystem-based adaptation, and blue tourism planning. Potential research priorities such as plastic waste management, seagrass carbon storage assessment, total carbon management and coastal management were also highlighted. He concluded by emphasizing RUPP’s growing role in advancing research, education, and capacity building to support sustainable coastal and marine resource management in Cambodia.

- 3.2 In her presentation titled “*An Update on Our Recent Work at GDOU, China,*” **Dr. Shenghui Li** from Guangdong Ocean University (GDOU) provided an overview of the university’s ongoing research and development initiatives in marine and coastal management. She highlighted several key research projects focused on advancing the sustainable development of the marine sector in Guangdong Province, including studies on the high-quality development of the modern marine ranching industry, transboundary marine spatial planning within the Guangdong–Hong Kong–Macao Greater Bay Area, and the historical evolution of coastal spatial utilization. Additional projects addressed the optimization of aquaculture spatial planning and resource allocation, as well as the revision of aquaculture zoning and tidal flat management at the local government level. These initiatives demonstrate GDOU’s strong engagement in supporting evidence-based marine policy and regional planning. The presentation also introduced the *Ocean Literacy Across Languages (OLAL)* initiative, which aims to enhance public understanding of ocean issues through multilingual approaches and global knowledge sharing. This includes the development of an online database of ocean literacy projects under the ECOP Programme, featuring information on project types, focus

areas, geographic scope, and links to the UN Ocean Decade. She further highlighted ongoing publication efforts, including collaborations with Shanghai Jiao Tong University Press to produce an ocean literacy series, with upcoming works focusing on best practices and the status of ocean literacy in China. She concluded by emphasizing the importance of international collaboration and knowledge exchange to strengthen ocean literacy, support marine governance, and advance sustainable ocean development.

3.3 **Ms. Ye Liangying (Phoebe)**, Executive Director of the Department of Capacity Building and Communication at the Fujian Institute for Sustainable Oceans (FISO), Xiamen University, presented on “*Fujian Institute for Sustainable Oceans (Xiamen University) and Sustainable Coastal Development Capacity-Building Research Lab.*” She began by introducing FISO as a provincial-level science and technology platform established in 2020 under the Fujian Ocean Innovation Center, designed to integrate science, technology, governance, and finance to support sustainable ocean development. The institution adopts a cross-sectoral and interdisciplinary approach, bringing together expertise from environmental science, economics, policy, law, and management to promote innovation, research, and knowledge transfer for societal sustainability. She highlighted the role of the Sustainable Coastal Development Capacity Building Lab (SCD Lab), established in 2023, which focuses on evaluation, capacity enhancement, applied research, and country-specific studies to support coastal development. The presentation emphasized FISO’s contributions to global public goods through the development of the *Capacity Index of Sustainable Coastal Development (CISCD)*, which has been published annually since 2021, covering up to 50 countries along the Maritime Silk Road. This index supports policy development and prioritization aligned with the SDGs, supported by standardized indicators and advanced data processing platforms. Ms. Ye also highlighted the establishment of the *International Collaboration Network for Sustainable Coastal Development (SCD Network)*, involving institutions from multiple countries to strengthen research collaboration, capacity building, and policy dialogue. Furthermore, she presented FISO’s strong capacity-building initiatives, including international training programs on marine spatial planning and integrated coastal management, short courses attended by over 400 participants from 17 countries, scholarship programs for ASEAN students, and the development of ICM video courses showcasing Xiamen’s best practices. The presentation concluded by highlighting ongoing international collaborations, including joint marine spatial planning projects in Malaysia and Indonesia, visiting scholar programs, and opportunities for future cooperation in training, research, and sustainable coastal development initiatives.

3.4 **Dr. Rudhi Pribadi** from Diponegoro University presented on “*Coastal Landscape Unity: Integrated Approach Toward Sensible Coastal Restoration and Rehabilitation.*” He began by outlining the increasing pressures on coastal ecosystems in Indonesia, particularly in Central Java, where coastal degradation, land-use change, and climate-related risks necessitate a more integrated and science-based management approach. He introduced the *State of the Coast (SOC)* reporting framework as a key tool promoted by PEMSEA to assess coastal conditions, identify governance gaps, and support planning, investment, and monitoring. The SOC assessment in Central Java covers critical components such as coastal habitats, pollution, fisheries, infrastructure, climate vulnerability, and governance systems, providing a comprehensive baseline for decision-making. The presentation further highlighted the implementation of the *Mangrove Landscape Unit (KLM)* approach, which integrates ecological, spatial, and socio-economic data to support coastal restoration and rehabilitation. Through extensive field surveys (over 300 sampling points), remote sensing analysis, and GIS-based mapping at scales of 1:25,000 and 1:50,000, the project generated detailed outputs including mangrove distribution maps, ecosystem inventories, thematic function

maps, and ecosystem service assessments. Dr. Pribadi emphasized a multiphase methodology combining secondary data analysis, field validation, and advanced spatial modeling, including NDVI analysis, coastal vulnerability indexing, and time-series monitoring of mangrove changes. The approach also incorporates socio-economic assessments to understand community dependence, governance structures, and local challenges, ensuring that restoration strategies are both ecologically sound and socially inclusive. He also highlighted the identification of priority areas for mangrove rehabilitation using spatial scoring, biodiversity indices, hydrological analysis, and vulnerability assessments, alongside the integration of land status and ecosystem services such as carbon storage. The presentation concluded by stressing the importance of linking science, policy, and community engagement to achieve effective coastal restoration, noting that integrated coastal governance and ecosystem-based approaches are essential to enhance resilience and sustainability in Indonesia's coastal regions.

- 3.5 **Mr. Glenn Bryan A. Creencia** of Cavite State University (CvSU) presented on “Cavite State University (CvSU) Initiatives on Integrated Coastal Management, Climate Change Adaptation, and Blue Carbon.” He began by introducing CvSU as a key academic institution in the Philippines, highlighting its strong mandate in research, innovation, and community extension through its College of Agriculture, Food, Environment, and Natural Resources. He emphasized CvSU’s research-extension continuum approach, which bridges scientific research with on-the-ground application to directly benefit coastal communities. The presentation showcased a range of initiatives supporting integrated coastal management, including seagrass biodiversity assessment and rehabilitation, carbon stock assessment of wetlands in Manila Bay, and coral reef assessment and restoration efforts in Ternate, Cavite. These initiatives contribute to strengthening blue carbon knowledge and ecosystem resilience. Mr. Creencia further highlighted CvSU’s active role in capacity building and stakeholder engagement, including training programs for local government units (LGUs) and the organization of coastal summits to promote collaboration and knowledge exchange. The establishment of marine protected areas (MPAs) and the turnover of scientific data to local stakeholders were also emphasized as critical steps in supporting evidence-based decision-making. Through these integrated efforts—combining science, policy support, and community engagement—CvSU demonstrates a practical model for advancing coastal sustainability, climate adaptation, and blue carbon initiatives at the local and regional levels.
- 3.6 In his presentation titled “Marine Litter Monitoring Survey in Manila Bay Philippines (2023–2025),” **Dr. Johnny Ching** presented the results of a comprehensive multi-year assessment conducted under the project Enhancement of Marine Litter Management in Manila Bay, supported by KOICA, KOEM, OSEAN, DENR, and EcoWaste Coalition. He began by emphasizing that marine litter is a complex and multi-dimensional issue affecting not only marine ecosystems but also public health, fisheries productivity, and coastal livelihoods. The study covered Manila Bay a semi-enclosed and highly urbanized coastal system influenced by multiple river inputs using standardized monitoring protocols across different sites and seasons to generate baseline data on litter composition, distribution, and trends. The findings revealed a significant reduction in marine litter between 2023 and 2025, with decreases of 48% in total litter counts, 47% in plastic litter counts, and 45% in total weight, indicating positive impacts of ongoing rehabilitation efforts and multi-sectoral interventions. However, plastics remain the dominant component of marine debris, largely driven by single-use consumer products such as sachets, food packaging, and beverage containers. The study also showed that marine litter accumulation is more strongly influenced by continuous anthropogenic pressures and urban waste leakage rather than seasonal variation, highlighting the chronic nature of the problem. Spatial analysis further indicated higher litter densities in

urbanized areas compared to less-developed coastal sites. Dr. Ching concluded that addressing marine litter in Manila Bay requires sustained and integrated management strategies, including stronger policy enforcement, upstream waste reduction, improved materials recovery systems, and watershed-based interventions to prevent land-based leakage. He also emphasized the importance of continuous monitoring, stakeholder engagement, and community participation particularly through citizen science approaches—to support adaptive management and long-term improvement of coastal environmental quality.

- 3.7 **Dr. Ruby Castrence-Gonzales** from Mindanao State University at Naawan presented on the university's initiatives in advancing integrated coastal management, blue carbon, and sustainable marine resource management. She emphasized the institution's multidisciplinary approach through its four colleges, particularly its strong focus on fisheries, marine sciences, and environmental sustainability. The presentation highlighted several flagship programs, including the *DAGAT Program*, which focuses on aquatic biodiversity, fish health, sustainable aquaculture, marine spatial planning, and climate resilience, as well as the *KALIKASAN Program*, which promotes green technologies, microplastic pollution mitigation, circular economy approaches, and ecosystem resilience. These programs demonstrate the university's commitment to addressing both ecological and socio-economic challenges in coastal and marine systems. She further highlighted ongoing blue carbon initiatives, including contributions to the National Blue Carbon Action Plan and research on mangrove and seagrass carbon estimation involving both undergraduate and graduate students. A key innovation presented was the *Coastal Vulnerability Assessment Tool (CVAT)*, which is used to assess exposure, sensitivity, and adaptive capacity of coastal communities to climate-related risks such as sea-level rise, erosion, and extreme weather events. The tool has been applied by local government units (LGUs) to support disaster risk reduction and integrated coastal planning. In addition, the university actively conducts capacity-building initiatives, including ICM planning support and participatory resource and social assessments with local stakeholders. She concluded by emphasizing the importance of strengthening collaboration between academia, government, and communities to enhance coastal resilience and promote sustainable development in the Philippines
- 3.8 **Ms. M.F. J. Nieva**les from the University of the Philippines Visayas (UPV) presented on "*University of the Philippines Visayas: Living the Sustainability Challenge*." She began by introducing UPV as a leading national academic institution with a strong focus on fisheries, marine science, and regional sustainable development. She emphasized UPV's role in integrating education, research, and extension to support environmental stewardship, food security, and the blue economy. The presentation highlighted UPV's sustainability framework built on three core pillars economic growth, environmental sustainability, and social equity positioning the university as a key driver of science-based solutions for coastal and marine resource management. Ms. Nievales further outlined UPV's extensive research infrastructure and initiatives, including marine biological stations, aquaculture centers, and biodiversity hubs that function as living laboratories for ecosystem monitoring and conservation. Key programs include habitat and biodiversity management through large-scale reforestation, arboretum development, wildlife protection, and biodiversity monitoring systems, as well as marine and coastal research focusing on ecosystem health and sustainable aquaculture. She also highlighted community-based initiatives such as marine litter management through circular economy approaches, coastal livelihood diversification projects like sea cucumber aquaculture (SEA-CURE), and continuous water quality and biodiversity monitoring. The presentation concluded by emphasizing UPV's strong commitment to multidisciplinary collaboration, capacity building, and community engagement, demonstrating a holistic and

practical model for advancing sustainability in coastal and marine environments

- 3.9 In her presentation titled “*Turning Tides: Research, Restoration, and Resilience in Action*,” **Ms. Astrid L. Sinco** from Xavier University – Ateneo de Cagayan, through the McKeough Advancement for Environment, Resilience, and Sustainability (MAERS) Center, presented an overview of the university’s ongoing initiatives in coastal management, biodiversity conservation, and environmental resilience. She highlighted key programs under habitat and biodiversity management, including the *Mangreabay Project* on mangrove rehabilitation in Macajalar Bay and the McKeough Marine Exploration (MM-X) Program, which supports marine ecosystem research and monitoring. Additional initiatives such as phytoplankton studies in Lake Danao demonstrate the university’s commitment to understanding ecosystem dynamics and supporting science-based conservation. The presentation also emphasized MAERS Center’s strong focus on pollution management, including participation in the Annual International Coastal Clean-up, research on microplastics in marine species, and studies on human exposure to microplastics through seafood consumption. In the area of blue carbon, Ms. Sinco highlighted ongoing assessments of carbon stocks in mangrove ecosystems and community-based initiatives such as *Project CARE*, which integrates mangrove rehabilitation with capacity building and sustainable livelihood development. This program, implemented in partnership with local organizations, reflects a holistic approach that links ecosystem restoration with social resilience. She concluded by emphasizing the importance of research-driven action, community engagement, and multi-stakeholder collaboration in advancing sustainable coastal development and strengthening resilience in vulnerable coastal communities.
- 3.10 **Mr. Sakanan Plathong** from the Marine Science Learning Center, Prince of Songkla University, Thailand, presented on strengthening capacity building in Marine Spatial Planning (MSP) and Integrated Coastal Management (ICM) as key approaches to support sustainable coastal and marine governance. He emphasized that MSP serves as a critical tool to balance multiple ocean uses, reduce conflicts, and promote a sustainable blue economy, particularly in complex coastal systems such as the Gulf of Thailand and the Andaman Sea. Through his work, he highlighted the integration of scientific research, policy development, and stakeholder participation, including ecosystem monitoring, biodiversity assessment, and environmental impact analysis, to support evidence-based decision-making. The presentation showcased Thailand’s strong efforts in capacity building through the development of MSP manuals, training programs for government officers, and regional collaborations such as the China–Thailand MSP program and ASEAN initiatives. He also highlighted the implementation of MSP pilot sites in areas such as Ko Lan, Ko Sichang, and Phang Nga Bay, where multi-use conflicts are addressed through participatory planning, zoning, and compatibility assessments involving multiple provinces and local administrative organizations. In addition, he presented ongoing research contributions, including coastal erosion monitoring, marine biodiversity studies, and the discovery of new marine species, demonstrating the importance of scientific data in supporting coastal management. He concluded by emphasizing that strengthening institutional capacity, regional collaboration, and science-based planning is essential to scale up MSP implementation and achieve sustainable coastal and marine resource management in Thailand.
- 3.11 **Mr. Walter Oliveira Soares** from the Universidade Nacional Timor Lorosa’e (UNTL), Timor-Leste, presented on “*Research Activities at UNTL in Timor-Leste*.” He began by outlining the key environmental challenges faced by Timor-Leste, particularly the increasing issue of marine plastic pollution driven by both domestic sources and transboundary debris from the ATS (Arafura and Timor Seas) region. He highlighted findings from marine debris monitoring

in Dili and Liquiça, showing seasonal variations in waste volume, with significantly higher accumulation during the wet season due to strong winds and coastal inundation. The data revealed that foreign-sourced waste dominates local debris composition, underscoring the need for regional cooperation in addressing marine pollution. He further presented Timor-Leste's progress in implementing Integrated Coastal Management (ICM), including the establishment of pilot sites in Dili-Atauro, Liquiça, and Manatuto, which incorporate activities such as marine protected areas (MPAs), seaweed cultivation, small-scale livelihoods, and the implementation of *Tara Bandu* (customary law) for local resource governance. UNTL has also contributed to baseline assessments and ICM planning, integrating physical, ecological, and socio-economic data. In addressing climate change, he emphasized both physical measures, such as mangrove rehabilitation, and non-physical approaches including education, community awareness, and capacity building targeting coastal communities and students. The presentation also highlighted ongoing efforts in blue carbon development, marine spatial planning, and trilateral cooperation with Indonesia and Australia on integrated river basin management. He concluded by noting that while Timor-Leste has made significant progress in marine protection, climate adaptation, and regional collaboration, key challenges remain in scaling up ecosystem-based management, strengthening data and monitoring systems, and enhancing community engagement. Future priorities include tackling land-based pollution, expanding mangrove restoration, improving research and capacity development, and reinforcing regional partnerships to support a resilient and sustainable blue economy in Timor-Leste.

- 3.12 In his presentation titled "*Timor-Leste: Updates on Marine Spatial Planning Development*," **Mr. Mateus Salvador** provided an overview of the country's progress in advancing Marine Spatial Planning (MSP) within the broader Blue Economy framework. He began by outlining Timor-Leste's coastal and marine context as a Small Island Developing State, highlighting its 750 km coastline, rich marine biodiversity, and strategic location within the Coral Triangle. He emphasized that MSP is a key policy tool to balance ecological, economic, and social objectives, while addressing critical challenges such as marine pollution, user conflicts, coastal development pressures, climate change, and illegal, unreported, and unregulated (IUU) fishing. MSP has been formally integrated into the national development agenda under the IX Constitutional Government, reflecting strong political commitment to sustainable ocean governance. The presentation further detailed the progress of MSP development, including the establishment of an MSP Directorate, capacity-building collaborations with Indonesia and international partners, and a series of national workshops, technical trainings, and data collection efforts across multiple municipalities. Mr. Salvador highlighted that significant groundwork has been undertaken, including the development of a legal framework for national maritime spatial planning, now approved by the Council of Ministers, as well as ongoing efforts to establish technical guidelines, spatial data infrastructure, and centralized databases. He also emphasized the importance of integrating traditional governance systems such as *Tara Bandu* into coastal and marine management, alongside formal policy frameworks. In addition, he presented key enabling conditions and remaining challenges, including limited funding, the need for stronger institutional coordination, data-sharing mechanisms, and the development of clear planning objectives and technical standards. The presentation also highlighted Timor-Leste's marine conservation efforts, including the establishment of marine protected areas (MPAs) such as Nino Konis Santana National Park and Atauro Island, as well as national targets to expand marine protection coverage. He concluded by emphasizing that strengthening data systems, capacity building, and regional collaboration will be essential to fully operationalize MSP and support the development of a resilient and sustainable blue economy in Timor-Leste.

- 3.13 **Dr. Hoang Hai** from the University of Danang presented on the institution's contributions to sustainable coastal and river basin management in Central Vietnam. He emphasized the importance of integrating research, capacity development, and policy engagement to address key environmental challenges, including climate change adaptation, blue carbon development, and integrated river basin management (IRBM). He noted that scientific evidence and environmental monitoring play a crucial role in supporting policy decisions and strengthening sustainable management practices. Using the Vu Gia–Thu Bon River Basin as a case study, he highlighted ongoing efforts in water quality monitoring, pollution control, and integrated governance, demonstrating a scalable model for IRBM that connects upstream river systems with downstream coastal areas. He also presented the Son Tra Peninsula as a model for coastal ecosystem management, emphasizing its biodiversity significance and potential for blue carbon, supported by the application of GIS, remote sensing, and environmental monitoring tools. He concluded by stressing that combining science-based approaches with regional collaboration can support climate resilience, biodiversity conservation, and sustainable coastal development, offering replicable models for the East Asian Seas region.
- 3.14 **Prof. Qinhua Fang** from the Coastal and Ocean Management Institute (COMI), Xiamen University, presented on *“Risk Assessment of Marine Species under Global Change.”* He began by introducing COMI as a multidisciplinary center of excellence in coastal and ocean management, supported by strong research infrastructure, international collaboration, and integrated expertise in marine science, policy, and governance. He then highlighted the growing pressures on marine ecosystems driven by climate change—such as ocean warming and sea-level rise—combined with increasing human activities, which collectively threaten biodiversity and ecosystem services. He emphasized a critical gap in current research and management approaches, noting that most studies focus on single stressors or individual species, while real-world conditions involve multiple interacting pressures that create cumulative and cascading ecological risks. To address this gap, Prof. Fang introduced an integrated framework that assesses both single-species and multi-species risks under global change scenarios. The approach evaluates cumulative risks across space and time for key coastal ecosystems such as mangroves, seagrass beds, and coral reefs, while also incorporating species interactions such as competition, predation, and symbiosis. He explained that the project utilizes a combination of historical data, open databases, and field surveys, integrating climate, oceanographic, habitat, and human activity data into a unified spatial framework to generate risk maps and regional assessment tools. The presentation also highlighted the strong research infrastructure supporting the project, including field observation stations, research vessels, and key laboratories. He concluded by emphasizing the regional applicability of these tools to support marine spatial planning, biodiversity conservation, and climate adaptation, and encouraged stronger collaboration across East and Southeast Asia to enhance coastal resilience under global environmental change.
- 3.15 **Dr. Akhmad Solihin** from the Center for Coastal and Marine Resource Studies (PKSPL-IPB University) presented on *“Lessons from Blue Carbon in Indonesia: Integrating Ecosystem Services into Sustainable Financing and Policy.”* He emphasized the importance of linking blue carbon science with economic valuation and policy instruments to support sustainable financing mechanisms. Drawing from extensive research across 163 mangrove locations and multiple seagrass ecosystems in Indonesia, he highlighted the significant carbon storage potential of coastal ecosystems, including above-ground, below-ground, and soil carbon stocks. He noted that despite this high potential, gaps remain in emission factors, baseline data, and long-term monitoring, particularly for seagrass ecosystems, which are still underrepresented in national carbon accounting. He further introduced an innovative

approach to *blue financing*, demonstrating how carbon values can be translated into socio-economic benefits, such as supporting national health insurance schemes (BPJS) through ecosystem-based contributions. Using scenario-based modeling, he illustrated how different land-use and vegetation conditions affect carbon value and disaster risk reduction benefits, showing that maintaining and restoring coastal ecosystems can generate significant economic returns while reducing climate-related risks. The presentation also outlined a conceptual model for establishing carbon emission baselines in seagrass ecosystems, aligned with IPCC guidelines, incorporating both historical trends and future scenarios to improve emission estimates. In addition, Dr. Solihin highlighted Indonesia's evolving regulatory framework for carbon and blue carbon, including policies on carbon trading, carbon tax, and carbon economic value under national laws and ministerial regulations. These frameworks support mechanisms such as Measurement, Reporting, and Verification (MRV), carbon exchanges, and result-based payments, enabling the integration of blue carbon into national climate commitments (NDC). He concluded by emphasizing that strengthening data systems, standardizing methodologies, and integrating ecosystem service valuation into financial and policy instruments are essential to scale up blue carbon initiatives and support sustainable coastal development in Indonesia.

- 3.16 **Dr. Meng Yan** from the State Key Laboratory of Marine Environmental Health (SKLMEH), City University of Hong Kong, presented on recent progress in research and capacity development in marine pollution and ecosystem health. She emphasized the importance of integrating advanced science, technology, and policy to support ecological civilization and sustainable blue economy development. The laboratory focuses on three core themes: pollution monitoring and control, biodiversity conservation, and ecosystem restoration. She highlighted the use of innovative technologies such as water quality sensors, rapid toxicological screening, eDNA-based biodiversity monitoring, satellite remote sensing, and digital twin systems to improve environmental assessment and decision-making. She also presented the Global Estuaries Monitoring Program under the UN Decade of Ocean Science, involving 2,500 water samples from 51 countries and 187 estuaries, which supports global data sharing, pollution monitoring, and evidence-based water quality management. In addition, she highlighted practical ecosystem restoration efforts, including the development of eco-shoreline designs applied to artificial seawalls, demonstrating successful integration of engineering and ecological approaches. The project has received international recognition and has been adopted as a reference for environmental policy. She concluded by emphasizing the importance of capacity building, knowledge transfer, and innovation through partnerships, startups, and outreach activities to scale up marine environmental solutions and support sustainable coastal management globally.
- 3.17 In his presentation titled "*Development of a Pollution Management Plan for Bali Coastal Areas*," **Dr. Ketut Gede Dharma Putra** from the Center for Sustainable Development, Udayana University, presented an overview of ongoing efforts to address coastal pollution and strengthen environmental management in Bali, particularly in the Benoa Bay area. He highlighted the complexity of pollution sources in this highly developed coastal zone, including inputs from rivers, wastewater treatment facilities, tourism infrastructure, ports, and urban activities. The presentation emphasized the need for an integrated and science-based pollution management approach that combines monitoring, infrastructure development, and community engagement. Dr. Putra outlined several key initiatives, including the Bali Solid Waste Management program, which focuses on waste characterization, public education on waste sorting, and the development of TPS3R (Reduce-Reuse-Recycle Waste Processing Sites) facilities, particularly in areas such as Nusa Dua. He also presented marine pollution monitoring activities involving regular environmental quality assessments in coastal and

marine areas to support evidence-based decision-making. In addition, he highlighted impact assessments of wastewater treatment facilities, including innovative studies on reusing treated wastewater as a potential raw water source and utilizing algae biomass for energy production. The presentation also emphasized mangrove monitoring and rehabilitation efforts in Benoa Bay, including growth monitoring, replanting activities, and community-based initiatives that support local livelihoods through sustainable mangrove utilization. He concluded by stressing that addressing coastal pollution in Bali requires integrated planning, strong stakeholder collaboration, and continuous monitoring to ensure long-term environmental sustainability and resilience of coastal ecosystems.

- 3.18 **Dr. Keoduangchai Keokhamphui** from the National University of Laos presented on “*Key Water Quality Issues in Lao PDR: Contaminants, Sources, and Impacts.*” He emphasized the critical importance of water quality in supporting domestic use, agriculture, fisheries, and overall ecosystem services, noting that degraded water systems directly affect human health, livelihoods, and food security. He outlined the major water quality challenges in Lao PDR, highlighting sedimentation and turbidity as widespread issues, along with biological contamination such as *E. coli* that poses serious risks to drinking water safety. In addition, localized but significant threats from nutrients, pesticides, and heavy metals were identified as emerging concerns. He further explained that these issues are primarily driven by land-use changes and human activities, including deforestation and agricultural expansion leading to erosion and sediment runoff, untreated wastewater discharge from settlements, and localized impacts from mining and infrastructure development. Using case examples from provinces such as Huaphanh and Xiengkhouang, he demonstrated how land-use changes contribute to environmental degradation, compounded by limited data availability on sediment loads and nutrient export. The impacts of poor water quality were highlighted through increased risks of waterborne diseases, particularly affecting vulnerable rural communities, and the degradation of aquatic ecosystems and fisheries resources. The presentation also outlined ongoing programs and future directions, including integrated river basin management initiatives such as the Nam Tha River Management Project and upcoming water quality management projects in key river basins. He emphasized the importance of capacity building through technical training in groundwater monitoring, hydrological modeling, and climate-resilient river basin management. Additionally, he highlighted regional research collaborations focusing on AI-based water monitoring systems and early warning technologies. He concluded by stressing that strengthening data systems, improving cross-sector coordination, and enhancing technical capacity are essential to effectively manage water quality and support sustainable development in Lao PDR.
- 3.19 **Dr. Wansuk Senanan** from Burapha University presented on the development and role of the Burapha University Integrated Coastal Management (ICM) Learning Center in advancing sustainable coastal governance in Thailand. She emphasized the importance of strengthening institutional capacity through education, research, and stakeholder engagement to support effective ICM implementation. The Learning Center serves as a platform for knowledge generation and dissemination, focusing on coastal ecosystem management, marine biodiversity conservation, and sustainable resource use, while also facilitating collaboration between academia, government agencies, and local communities. She highlighted the Center’s contributions to capacity building through training programs, technical support, and community outreach activities that aim to enhance local understanding and participation in coastal management. In addition, the Learning Center supports applied research and data-driven decision-making to address key coastal challenges, including environmental degradation, resource conflicts, and climate change impacts. Dr. Senanan concluded by emphasizing that strengthening learning centers as hubs of knowledge exchange and

collaboration is essential to support integrated, science-based, and participatory coastal management, ultimately contributing to long-term sustainability and resilience of coastal areas in Thailand and the broader region.

SUMMARY OF GROUP WORKSHOP AND DISCUSSION (Day 2)

- 4.1 **Dr. Brian Szuster** and **Dr. Laura David** facilitated a group workshop and discussion on the role of PNLC and other universities in the PEMSEA Blue Carbon (BC) Program, exploring approaches, challenges, and opportunities. Participants were divided into five groups based on key themes: Blue Carbon; Integrated Coastal Management (ICM)/Integrated River Basin Management (IRBM); Marine Spatial Planning (MSP); Habitat Assessment/Management and Protected Area (PA) Management; and Climate Change/Disaster Resilience. Each group discussed three key questions: (1) Identify one program or activity that the group or PNLC can collaborate on under the specific theme; (2) Explain how this program or activity contributes to the PEMSEA Blue Carbon Program; and (3) Outline the resources or actions required to realize this program or activity.
- 4.2 The **Blue Carbon** working group presented on the development of a “Blue Carbon Blueprint: Planning, Resources, Integration, Engagement, Assessment, Monitoring, and Tracking.” The group emphasized the need for a comprehensive and structured framework to guide the implementation of blue carbon initiatives across the region. They highlighted that effective blue carbon development requires an integrated approach that connects scientific assessment, policy frameworks, stakeholder engagement, and financial mechanisms. The blueprint outlines key components, starting from strategic planning and resource mobilization, followed by integration across sectors and institutions, and active engagement of stakeholders including local communities, government, and private sector actors. The group further stressed the importance of standardized assessment methodologies and robust monitoring systems to ensure data accuracy, transparency, and comparability across sites. Monitoring and tracking mechanisms were identified as critical elements to support carbon accounting, reporting, and verification processes, as well as to track progress and outcomes of blue carbon projects. In addition, the framework promotes adaptive management by linking scientific data with policy implementation and decision-making processes. They concluded that the development of a unified blue carbon blueprint can enhance coordination, improve implementation efficiency, and support the scaling up of blue carbon initiatives. However, key challenges remain, including limited technical capacity, data gaps, and the need for stronger institutional collaboration and financing mechanisms. Addressing these challenges will be essential to fully realize the potential of blue carbon ecosystems in contributing to climate mitigation, coastal resilience, and sustainable development.
- 4.3 The **ICM/IRBM** working group presented key recommendations focusing on strengthening integrated approaches to pollution management and ecosystem-based governance. The group emphasized the need to establish a comprehensive research and monitoring program on pollution transport, highlighting that land-based and riverine pollution pathways must be assessed through an integrated source-to-sea approach. They noted that blue carbon ecosystems, including mangroves and seagrasses, are significantly affected by pollution, which undermines their capacity to provide climate mitigation and ecosystem services. Therefore, addressing pollution is essential to sustain blue carbon benefits. The group also highlighted the importance of strengthening funding mechanisms to support capacity building and joint international research, particularly in developing countries. Key enabling actions identified include the establishment of data-sharing mechanisms across institutions and

countries to improve coordination and evidence-based decision-making. In addition, the group proposed the development of unified ecosystem health indicators to standardize monitoring and assessment across regions. They concluded that advancing ICM and IRBM requires stronger integration of science, policy, and financing, supported by regional collaboration, to effectively address pollution challenges and enhance coastal and river basin resilience.

- 4.4 The **MSP** (Marine Spatial Planning) working group presented a conceptual framework linking Blue Carbon Ecosystems (BCE), Marine Spatial Planning (MSP), and Integrated Coastal Management (ICM) to support sustainable ocean governance and blue economy development. The group emphasized that BCE conservation should be positioned as a core component of ocean conservation strategies, supported through mechanisms such as Marine Protected Areas (MPAs), Other Effective Area-Based Conservation Measures (OECMs), and Locally Managed Marine Areas (LMMAs). These approaches are critical tools within MSP to allocate space, reduce use conflicts, and enhance ecosystem protection while contributing to climate mitigation and coastal resilience. The framework highlighted the central role of the PEMSEA Network of Learning Centers (PNLC) in bridging science, policy, and practice, particularly in integrating MSP and ICM approaches to enable ecosystem-based management. The group also outlined key strategic actions to operationalize MSP implementation, including identifying funding sources from international organizations such as WWF, ADB, World Bank, and GEF; strengthening collaboration with regional partners such as PEMSEA, COBSEA, and WESTPAC; promoting joint research initiatives; and enhancing capacity building across institutions. The discussion underscored that effective MSP requires strong coordination, financing mechanisms, and knowledge-sharing platforms to integrate blue carbon into spatial planning and support the transition toward a sustainable and inclusive blue economy.
- 4.5 The **Habitat Assessment/Management and Protected Area (PA) Management** working group presented a proposed program titled “*MAP-BLUE: Mapping and Adaptation for Policy in Blue Carbon*,” which aims to strengthen the scientific and policy foundation for blue carbon ecosystem management. The group emphasized the importance of comprehensive baseline assessments, including mapping the location, status, and extent of coastal habitats such as mangroves and seagrasses. This includes evaluating the effectiveness of Marine Protected Areas (MPAs) through site visits, data collection, and long-term monitoring systems. They highlighted the need for standardized data-sharing mechanisms and the development of centralized databases to support consistent mapping and informed decision-making across regions. The program also integrates blue carbon valuation into economic sectors such as tourism, supported by carbon stock calculation and data-driven assessment to demonstrate ecosystem value. In addition, the group identified key enabling factors for successful implementation, including strengthening knowledge and human capacity, as well as securing sustainable funding sources. They also emphasized the role of habitat assessment and management in supporting policy development, particularly in aligning conservation efforts with climate adaptation strategies. The group concluded that MAP-BLUE can serve as a practical framework to link science, policy, and financing, enabling more effective and scalable blue carbon management across coastal and marine ecosystems.
- 4.6 The **Climate Change** working group presented key insights on strengthening climate resilience through integrated coastal and marine management approaches. The group emphasized that climate change impacts—such as sea-level rise, increased storm intensity, coastal erosion, and ecosystem degradation—are already affecting vulnerable coastal communities and critical ecosystems, including mangroves, seagrasses, and coral reefs. They highlighted the important role of nature-based solutions, particularly blue carbon ecosystems,

in mitigating climate change while simultaneously enhancing coastal protection and supporting livelihoods. The group also underscored the need to integrate climate adaptation and mitigation strategies into Marine Spatial Planning (MSP) and Integrated Coastal Management (ICM) frameworks to ensure more holistic and forward-looking planning. Key priority actions identified include strengthening climate data and monitoring systems, improving risk assessment and vulnerability mapping, and enhancing early warning systems. In addition, the group emphasized the importance of capacity building, regional collaboration, and access to climate financing mechanisms to support implementation at local and national levels. They concluded that addressing climate change in coastal and marine areas requires strong coordination between science, policy, and practice, supported by inclusive stakeholder engagement and sustained investment. Integrating climate considerations into coastal governance frameworks will be essential to build resilient ecosystems and communities while advancing sustainable blue economy development.

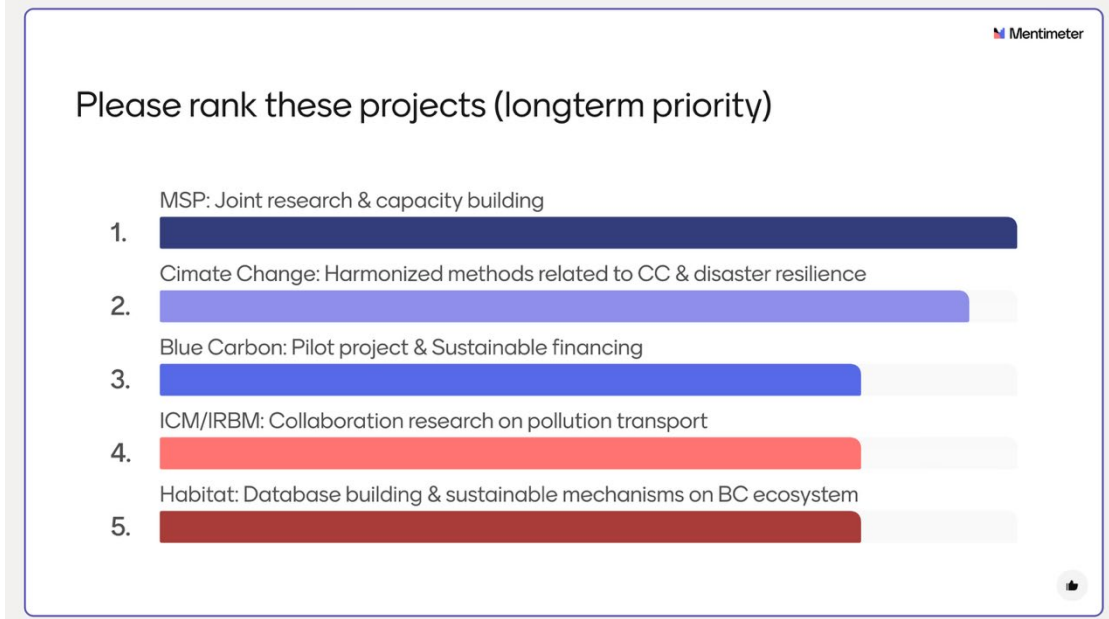
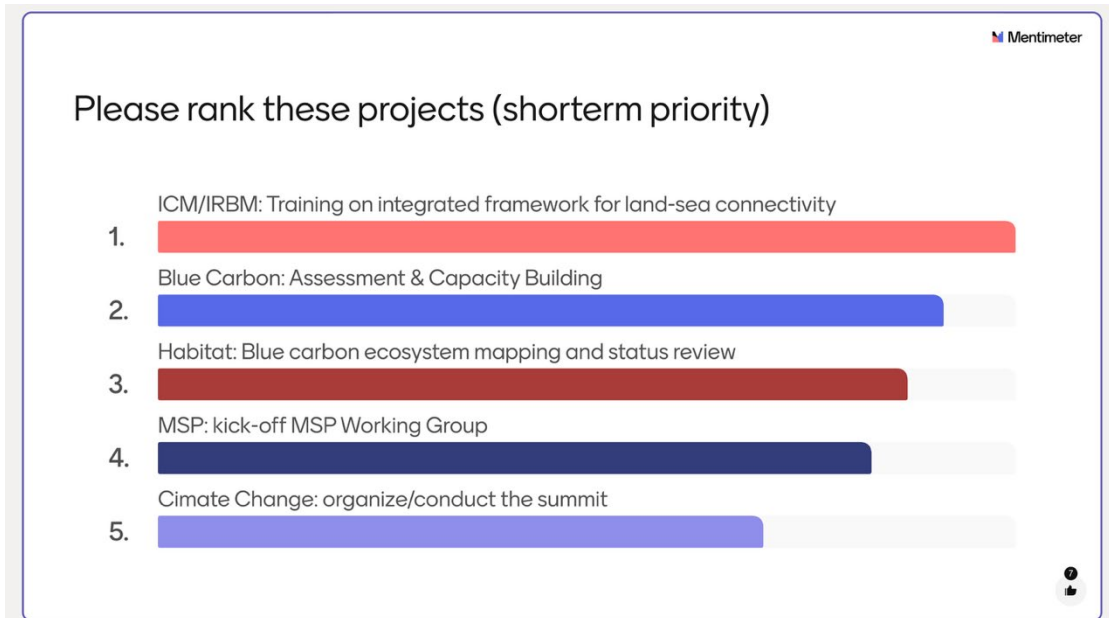
SUMMARY OF SPECIAL SESSION

- 5.1 In the Special Session titled “*Nature-Based Solutions for Coastal Resilience: Case Studies from Thailand*,” **Dr. Wansuk Senanan** from the Department of Aquatic Science, Faculty of Science, Burapha University presented practical experiences in applying nature-based solutions (NbS) to enhance coastal resilience. She highlighted how coastal ecosystems such as mangroves, seagrasses, and other natural habitats play a critical role in mitigating coastal hazards, including erosion, storm surges, and climate change impacts. Through case studies in Thailand, she demonstrated how ecosystem-based approaches can provide cost-effective and sustainable alternatives to conventional engineering solutions while delivering multiple co-benefits, including biodiversity conservation, livelihood support, and carbon sequestration. Dr. Senanan emphasized the importance of integrating scientific knowledge, community participation, and policy support in implementing NbS effectively. She also discussed key challenges, such as balancing development pressures with conservation goals, ensuring long-term ecosystem maintenance, and strengthening institutional coordination. The presentation underscored that successful NbS implementation requires adaptive management, continuous monitoring, and strong collaboration among stakeholders. She concluded that scaling up nature-based solutions is essential for building resilient coastal communities while simultaneously contributing to climate mitigation and sustainable coastal development.

SUMMARY PLENARY DISCUSSION: AGREEMENTS ON SPECIFIC PROGRAMS/ AND ROLE OF PNLC AND UNIVERSITIES IN THE BC SPHERE

- 6.1 During the plenary discussion on “*Agreements on Specific Programs and the Role of PNLC and Universities in the Blue Carbon (BC) Sphere*,” participants collectively identified priority actions for both short-term and long-term implementation. In the short term, the discussion emphasized the urgency of strengthening capacity development through training on integrated coastal management frameworks (ICM/IRBM), blue carbon assessment and capacity building, and ecosystem mapping and status reviews. Initial institutional actions such as establishing an MSP working group and organizing climate-related summits were also highlighted as immediate steps to build coordination and awareness. For the long term, the discussion focused on scaling up collaborative and systemic efforts, including joint research and capacity building under marine spatial planning (MSP), the development of harmonized methodologies for climate change adaptation and disaster resilience, and the implementation of blue carbon pilot projects supported by sustainable financing mechanisms. Participants also underscored the importance of strengthening data systems, including database development for blue carbon ecosystems, and advancing collaborative research on pollution transport under

ICM/IRBM frameworks. Overall, the discussion reaffirmed the critical role of PNLC and universities as key drivers in advancing blue carbon initiatives through integrated functions in capacity development, scientific research, project implementation, and technical support for certification systems.



SUMMARY DEFINING NEXT STEPS AND COMMITMENTS FOR PNLC

- 7.1 In the discussion on “*Defining Next Steps and Commitments for PNLC*,” **Prof. Dr. Qinhua Fang**, Vice-President of PNLC, outlined strategic directions to advance regional collaboration on blue carbon and integrated coastal governance. He emphasized a key insight that blue carbon initiatives cannot be pursued in isolation but must be integrated with frameworks such as Integrated Coastal Management (ICM), Marine Spatial Planning (MSP), Marine Protected

Areas (MPAs), and climate resilience strategies. He highlighted that blue carbon should be positioned as a cross-sectoral platform that connects science, policy, and implementation across the region. Prof. Fang presented four priority actions to guide PNLC's future work. First, the establishment of a Regional Blue Carbon MRV and Data Platform to support baseline assessments, mapping, standardized indicators, and data-sharing mechanisms. Second, the launch of a comprehensive capacity-building program, including training, field visits, and international collaboration, targeting diverse stakeholders such as local governments, communities, and policymakers. Third, the promotion of joint research and pilot projects at the regional level, focusing on key themes such as pollution–blue carbon linkages, MPA effectiveness, sustainable tourism, and carbon stock assessment. Fourth, the development of sustainable financing mechanisms, including partnerships with international organizations and exploration of innovative instruments such as blue carbon credits and blue finance. He further emphasized key requirements for implementation, including standardized methodologies, strong financing support, and strengthened partnerships across institutions, as well as inclusive governance involving local communities, women, youth, and Indigenous Peoples. He concluded by reaffirming the role of PNLC as a regional knowledge hub, capacity-building platform, and catalyst for partnerships, and outlined next steps including strengthening the Blue Carbon Task Force, developing a regional roadmap (2025–2030), initiating flagship projects, and expanding regional training programs.

ANNEXES:

Annex 1: Workshop Programme

Annex 2: List of Participants

Annex 3: Link to Workshop Presentations

Annex 4: Link to photos

Annex 1: Workshop Programme

PNLC Regional Workshop: From Knowledge to Action: Scaling Blue Carbon Initiatives in the East Asian Region

- Co-sponsors:** Luce Foundation, University of Hawai'i
University of the Philippines-Marine Science Institute
PEMSEA Network of Learning Centers (PNLC)
Ministry of Environment, Indonesia
- Organizers:** PNLC Secretariat
University of the Philippines-Marine Science Institute
PEMSEA Resource Facility
- Date:** March 24-27, 2026
- Venue** Antipolo and Manila, Philippines
- Participants:** Members from the PEMSEA Network of Learning Centers (PNLC) from Cambodia, China, Hong Kong, Japan, Laos PDR, Indonesia, Philippines, Thailand, Timor-Leste, Vietnam

BACKGROUND

In March 2025, a three-day training workshop on “*Integrating Blue Carbon into the Integrated Coastal Management (ICM) Framework*” was held in Chonburi, Thailand. Co-organized by Burapha University, the University of Hawai'i and the PEMSEA Resource Facility, with support from the Ministry of Higher Education, Science, Research and Innovation of Thailand, Thailand Science, Research and Innovation (TSRI), Henry Luce Foundation, and the Center for Southeast Asian Studies-University of Hawai'i, the training-workshop brought together 39 participants from Chonburi Province coastal management stakeholders and PNLC Members from Cambodia, China, Hong Kong, Indonesia, Lao PDR, Philippines, Thailand, Timor-Leste, and Vietnam.

The training-workshop tackled key challenges in ICM implementation and blue carbon integration and explored how East Asian Seas Region ICM experiences can incorporate blue carbon initiatives into existing coastal governance frameworks. Discussions focused on methodologies, collaboration opportunities, and aligning Blue Carbon plans with commitments, including the SDS-SEA, UNSDGs, and Post-2020 Biodiversity Framework.

Since the 2025 training-workshop, significant progress has been made in developing Blue Carbon Accounting Protocols, identifying BC enabling mechanisms, and establishing a regional BC Technical Working Group (TWG), with active participation from PNLC members.

Building on this foundation, this proposed follow-up workshop will focus on moving from knowledge to action: strengthening technical capacity, fostering collaboration, and scaling Blue Carbon initiatives across the East Asian Seas region.

As a network of higher educational institutions supporting country partners and local governments on coastal and marine issues in the EAS region, PNLC plays a valuable role in supporting capacity development and knowledge exchange. The workshop will serve as a platform to review progress

since the 2025 training, share site-level experiences and refine strategies for aligning Blue Carbon initiatives with regional and global sustainability frameworks, including the SDS-SEA Implementation Plan 2023-2027, UN SDGs, and the Kunming Montreal Global Biodiversity Framework.

OBJECTIVES

The primary objective of the workshop is to enhance PNLC members' capacity and commitment to provide knowledge and technical services to the region through the Blue Carbon Ecosystem Management Services Mechanism.

Specific Objectives:

1. Present progress made since the 2025 Blue Carbon Training: BC roadmap, mechanism, framework.
2. Present global/regional developments and directions on Blue Carbon.
3. Share site-level initiatives and experiences on Blue Carbon.
4. Introduce the PEMSEA Blue Carbon Ecosystem Services Management Mechanism (BCESMM) and the Regional BC Accounting Protocol (RBCAP) and get feedback.
5. Define the role of PNLC and other Universities in advancing the BC Program (capacity-building, research, certification, project development).
6. Identify collaborative opportunities among PNLC members and partners to support PEMSEA's Blue Carbon program.
7. Agree on a PNLC Blue Carbon engagement plan, aligned with regional and global sustainability targets, the SDS-SEA IP 2023-2027, UNSDGs, and KM Global Biodiversity Frameworks.

PROVISIONAL PROGRAM

Day / Time	Session	Resource Person
Day 1: 24 March	Arrival / Travel to Venue Dinner	
Day 2: 25 March		Main Anchor: Prof. Brian Szuster University of Hawai'i
08:00 – 08:30	Registration	
08:30 – 09:00	Opening Ceremony <ul style="list-style-type: none"> • Welcome remarks • Opening messages • Group Photo 	Ms. Aimee Gonzales, PRF Prof. Dr. Yonvitner, PNLC President Prof. Brian Szuster University of Hawai'i

09:00 – 09:15	Workshop Overview, Objectives and Expectation-setting Introductions of participants and speakers	PNLC Secretariat
09:15 – 10:15	Session 1: Global/Regional Status and Directions of Blue Carbon <ul style="list-style-type: none"> • International guidelines and institutional mechanisms 	Dr. Severino Salmo, University of the Philippines
10:15 - 10:30	Coffee / Tea Break	
10:30 - 11:30	Session 2: Global/Regional Status and Directions of Blue Carbon: Status of Blue Carbon Science	Dr. Malou McGlone, University of the Philippines-Marine Science Institute
11:30 - 13:00	Lunch Break	
13:00 – 14:00	Session 3: Global/Regional Status and Directions of Blue Carbon <ul style="list-style-type: none"> • Status of BC Supply • Market Mechanisms 	Dr. Michael Abundo, OceanPixel
14:00 – 15:00	Session 4: Presentation on the PEMSEA Blue Carbon Ecosystem Services Management Mechanism and the Regional BC Accounting Protocol	Ms. Kristina di Ticman, PEMSEA
15:00 – 15:15	Coffee/Tea Break	
15:15 – 17:00	Presentation of PNLC Members	
17:00 – 17:15	Wrap-up of Day 1 and program for Day 2	
17:15 - 18:00	Rest	
18:00 – 20:00	Dinner and Fellowship Night	
Day 3: 26 March		
08:30 – 09:00	Recap of Day 1	
9:00 – 10:15	Session 5: Group Workshop and Discussion on the Role of PNLC and other Universities in BC Program: approaches, challenges and opportunities	Facilitators: Dr. Brian Szuster and Dr. Laura David
10:15 – 10:30	Coffee / Tea Break	
10:30 – 11:30	Session 6: Presentation of Group Outputs and Synthesis	
11:30 – 13:00	Lunch Break	
13:00 – 13:45	Special Session: Nature-Based Solutions for Coastal Resilience: Case Studies from Thailand	Dr. Wansuk Senanan

		Department of Aquatic Science, Faculty of Science, Burapha University
13:45 – 14:30	Plenary Discussion: Agreements on Specific Programs/ and Role of PNLC and Universities in the BC Sphere (i.e. capacity development, research, project development, role in certification, etc.)	
14:30 - 15:15	Session 7: Defining next steps and Commitments for PNLC	Prof. Dr. Fang PNLC Vice-President
15:15 – 15:30	Closing Program	
15:30 – 16:00	Travel to Pinto Art Museum	
16:00 - 18:00	Pinto Art Museum for Dinner	
18:00 - 18:30	Travel to hotel	
Day 4: 27 March		
8:00	Check out and Departure for UPMSI	
9:00 – 12:00	PNLC General Assembly (at the UPMSI)	
12:00 – 1:00	Lunch (in campus)	
1:00 – 2:30	<p>Special Session: Conservation and Management of Marine Biodiversity</p> <p>Speaker 1: Prof. LUENG Mei Yee Kenneth (13:00-13:50) 1. Integrated approach for combating marine biodiversity loss 2. The UN-endorsed Global Estuaries Monitoring (GEM) Programme: An Update</p> <p>Speaker 2: Dr. MABOLOC Elizaldy Acebu (13:50-14:00) Larval biology and cultivation of marine invertebrates: implications for conservation and aquaculture management</p> <p>Speaker 3: Dr. YAN Meng (14:00-14:10) Applications of eDNA techniques in marine conservation and fisheries studies</p>	Host: Dr. Yan Meng, State Key Laboratory of Marine Environment Health (SKLMEH) / PNLC Regional Center of Excellence (RCOE) on Marine Pollution

	Q&A and Open Discussions on collaborations (14:10-14:30)	
2:30	Travel to Hotel Philippine Participants to travel home	
3:00 onward	Free time	
Day 5: 28 March	Travel home (for International participants)	

Annex 2: List of Participants

Country	Participants	Institution
Cambodia	Phat Chandara	Royal University of Phnom Penh (RUPP)
China	Dr. Shenghui Li	Guangdong University
	Prof. Dr.Fang Qinhua	COMI
	Prof. LEUNG Mei-Yee Kenneth	SKLMEH
	Dr. Elizaldy Acebu Maboloc	SKLMEH
	Prof. Dr. YAN Meng	SKLMEH
	Prof. Dr. Xue Xiongzhi	FISO-Xiamen University
	Phoebe YE Liangying	FISO-Xiamen University
	Lin Xiaoyan	FISO-Xiamen University
	Hu Xiaofen	FISO-Xiamen University
Indonesia	Dr. Rudhi Pribadi	UNDIP
	Dr. Ketut Gede Dharma Putra	UDAYANA : Center for Sustainable Development
	Dr. Akhmad Solihin	CCMRS-IPB University
	Prof. Dr. Yonvitner	CCMRS-IPB University
Laos PDR	Dr. Keoduangchai Keokhamphui	National University of Laos
Philippines	Dr. Ruby C. Gonzales	MSU-Naawan
	Dr. Astrid Sinco	XU-MAERS, Xavier University
	Dr. Marie Frances Nievaes	UP-Visayas (UPV)
	Dr. Laura David	UPMSI
	Dr. Johnny Ching	De La Salle U-Dasmarinas (DLSUD)
	Dr. Catherine Precioso	De LaSalle-Lipa (DLSL)
	Dr. Amyel Dale Cero	Cavite State U (CVSU)
	Glenn Bryan Creencia	Cavite State U (CVSU)
Thailand	Dr. Wansuk Senanan	Burapha University
	Dr. Sakanan Plathong	Prince Songkla
	Siriorn Sakdivilaiskul	Burapha University
Timor Leste	Walter Oliveira Soares	Universidade Nacional Timor Lorosa'e (UNTL)
	Mateus Salvador	UNIVERSIDADE ORIENTAL TIMOR LOROSA'E(UNITAL)
Vietnam	Dr. Hai Hoang	Danang University
Speakers and Facilitators		
USA	Prof. Dr. Brian Szuster	University of Hawai'i
Philippines	Dr. Severino Salmo	University of the Philippines
Philippines	Dr. Malou McGlone	University of the Philippines
Philippines	Tina di Ticman	PRF

Philippines	Dr. Michael Lochinvar Abundo	OceanPixel
Secretariat		
Indonesia	Isdahartati	CCMRS-IPB University
Indonesia	Dr. Lusita Meilana	CCMRS-IPB University
Philippines	Maida Aguinaldo	PRF
Philippines	Elsie Merina	PRF
Philippines	Jun Dacaymat	PRF
Philippines	John Christian Castillo	PRF

Annex 3: Link to Workshop Presentations

Resource Speakers:

https://drive.google.com/drive/folders/1Ag11Qj65L3PDBq5fwxFzfJDu3D5gWDUU?usp=drive_link

PNLC Members:

https://drive.google.com/drive/folders/1HT46GVGW5cCqL3NKEj5u0U-VTpbsfz4z?usp=drive_link

Annex 4: Link to photos

Days 1 to 3:

https://drive.google.com/drive/folders/1tKRbxch-a8QYCczVzh04ObQukruCPocx?usp=drive_link