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Capacity Building on Marine Debris Monitoring by Using Innovative Technologies in APEC Region

APEC Ocean and Fisheries Working Group

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PROJECT REPORT

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1. Project Overview[1]

1.1 Introduction

Marine debris poses significant threats to the marine environment, economic growth, maritime and food security, etc. According to the Update of 2009 APEC[2] Report on Economic Costs of Marine Debris to APEC Economies, the damage to the marine economy in the APEC region caused by marine debris is estimated over US$10.8 billion dollars in 2015. Initiatives related to combating marine debris have been proposed continuously to reduce the impact of marine debris globally. However, most APEC economies rely mainly on human resources to observe and remove marine debris, due to lacking the ability to trace the sources and locate converging hotspots, which results in inefficiency and labor intensity.

This project is designed to promote efficient marine debris monitoring and data analytics through the best practices sharing and information exchange, as well as showcase of the expertise on the application and accomplishment. And the themes will be mainly focused on:

1) Using Artificial Intelligence (AI) to identify marine debris.

2) Tracking the source and converging spots of drifted marine debris to enhance monitoring efficiency by adopting the remote sensing technology to map the spatial movement and distribution of marine debris.

3) Facilitating the regional collaboration with the assistance of innovative technology in APEC region.

Through a 2-day hybrid workshop, the capacity of marine debris monitoring will be built for both public and private sectors from APEC economies, especially for those bearing the brunt of marine debris issues by using innovative technologies, e.g., AI Identification, Marine Debris Dynamic Map (MDDM) with currents and winds information. The regional collaboration will also be further enhanced via the exchange and information sharing on challenges and gaps to explore the opportunities for future coordination and efficiency improvement on marine debris monitoring. Meanwhile, the business opportunities or related ventures can be introduced and facilitated as well.

1.2 Workshop Details

The Workshop of Capacity Building on Marine Debris Monitoring by Using Innovative

[1] Disclaimer: The terms "National" used for the purpose of this report do not imply the political status of any APEC economy.

[2] Asia-Pacific Economic Cooperation

Technologies in APEC Region initiated by Chinese Taipei and co-sponsored by Chile; Indonesia; Republic of Korea; Thailand; United States; and Viet Nam was held in hybrid format on March 24-25, 2022. Speakers and participants came from international organizations, research institutes, APEC member economies, academic sectors and few business associations and companies. The online format allowed wide participation by speakers and other attendees from APEC economies.

The event followed this agenda:

1) **Workshop Opening Ceremony and Welcome Remarks** given by Dr. Ching-Piao Tsai, Deputy Minister of OAC[3] and Dr. Su-Fen Chen, Director General of NMMST[4].

2) **Keynote Speeches 1: From Source to Sink:** The Innovative Technology of Monitoring and Modeling for Marine Debris: Explained how marine debris has impacted the environment, how important the monitoring and modeling are toward management, and what the crucial role the innovative technology is playing in the global and local context.

3) **Panel Discussion 1: Quantification of Marine Debris: Practice of Monitoring and Modeling in APEC Region:** Shared the undergoing projects and accomplishments of marine debris monitoring and modeling by innovative technology among APEC economies.

4) **Demonstration of Application of Innovative technology in Marine Debris Monitoring:** Showcased how unmanned aerial vehicle (UAV) has been utilized to acquire the monitoring data, and the related software is functioned to analyze the acquired images and footages.

5) **Keynote Speeches 2: Best Practice- Regional Partnership on Action Plan of Marine Debris Monitoring:** Explored the necessity of international collaboration, and how the adoption of advanced technology could be the foundation and catalyst among all APEC economies.

6) **Panel Discussion 2: Toward a Mutual Monitoring Platform of Marine Debris for APEC Region:** Discussed how the mutual marine debris monitoring mechanism and standard should be established, and how the accumulated data could be utilized more efficiently based on the practical experiences.

7) **Workshop Closing Ceremony:** Closing remarks addressed by Mr. Zih-Jia Li, Section

[3] Ocean Affairs Council

[4] National Museum of Marine Science & Technology

Chief of OAC.

There were 146 participants across APEC economies participating in the workshop over the two-dayevent, and 14 moderators and speakers from international organizations and APEC economies, including the UN[5]; the United States; Chile; Republic of Korea; Indonesia; Thailand; and Viet Nam joined the workshop. The speakers were:

- Mrs. Patrycja Enet, Expert Consultant of UN Secretariat of the Environment Management Group (France)
- Dr. Keith Alverson, Former Director of International Environmental Technology Centre, UN Environment Programme & Independent Consultant (The United States)
- Dr. Jiahn-Horng Chen, Vice President of NAMR[6], OAC (Chinese Taipei)
- Dr. Kuo-Hsin Tseng, Associate Professor of Center for Space and Remote Sensing Research, NCU[7] (Chinese Taipei)
- Mr. Cristian Enrique Brito Martinez, International Affairs Office of Ministry of Environment (Chile)
- Ms. Hillary Burgess, Monitoring Coordinator of Office of Response and Restoration, NOAA[8] (The United States)
- Dr. Jung-Yeul Jung, Principal Researcher of KRISO[9] (Republic of Korea)
- Dr. Hsiang-Wen Huang, Director General of OCA[10], OAC (Chinese Taipei)
- Mr. Nicholas Mallos, Senior Director of Trash Free Seas® Program, Ocean Conservancy (The United States)
- Dr. Jason Kao, Associate Professor of Yuan Ze University (Chinese Taipei)
- Dr. Jian-Wu Lai, Research Fellow of Marine Industry and Engineering Research Center, NAMR, OAC (Chinese Taipei)

[5] United Nations

[6] National Academy of Marine Research

[7] National Central University

[8] National Oceanic and Atmospheric Administration

[9] Korea Research Institute of Ships and Ocean Engineering

[10] Ocean Conservation Administration

- Dr. Devi Dwiyanti Suryono, Senior Researcher of Marine Research Center, Ministry of Marine Affairs and Fisheries (Indonesia)
- Dr. Jiraporn Charoenvattanaporn, Fishery Biologist & Director of Academic and International Research Division, DMCR[11] (Thailand)
- Ms. Nguyen Thanh Thao, Acting Director of Department of Geology and Minerals of Viet Nam, MONRE[12] (Viet Nam)

1.3 Challenges and Opportunities of the COVID-19 Pandemic

The most significant impact brought by the pandemic was the fact that face-to-face interaction was no longer possible in 2022. How to construct a sufficient and effective substitute for the on-site meeting has become the greatest challenge for this project. Meanwhile, finding the best common grounds for different participants in different time zones has posed challenges during the course of the events.

The event was conducted in a hybrid fashion, with the control room and offline participants (including members, some speakers and attendees) hosted in Chinese Taipei while speakers and participants from other APEC economies were attending virtually.

Due to the fact mentioned above, test runs with the participants, especially speakers, have to be conducted prior to the event to ensure both the equipment (e.g., the microphone, speaker and other hardware) and ambient conditions (e.g., the internet connection, surroundings, lighting of the room) are suitable for the event.

Other than that, since the core design of the events is meant to be highly interactive, a system of how members, speakers and attendees alike can efficiently interact with one another needs to be developed. This includes finding the best methods to conduct each session (e.g., video recording, live streaming and conference call), setting up the rules and protocols of how each participant should speak during the event, as well as utilizing the suitable platform and internet resources (e.g., Microsoft Teams and Slido).

Although the administrative process said above were highly efforts demanding. It did bring some positive opportunities out. Firstly, it has greatly reduced the difficulties for the participants to join the event since international travel was not required in the hybrid event. Within hybrid events, any participant of economies with access to the internet can participate, boosting the diversity of participants for the event held under this project.

[11] Department of Marine and Coastal Resources

[12] Ministry of Natural Resources and Environment

Secondly, this project finds that hybrid events can stimulate active event participation. On one hand, since the event collects questions and feedbacks online and those participants are able to raise questions anonymously, higher participation on the Q&A sessions and submission of feedbacks are observed. On the other hand, since time and effort from both the organizers and the event participants were put into the pre-event preparations, the actual participation and feedbacks from the registered participants is much more enthusiastic than that of regular on-site events.

Overly speaking, though the hybrid event was proposed as substitutes for the on-site event, the nature of the event is superior to on-site event in some fields and can contribute even more to the overall goal of the project.

2. Key Issues

2.1 Opening Remarks

In the opening remarks, **Dr. Ching-Piao Tsai (Deputy Minister of OAC, Chinese Taipei)** stressed the frameworks and actions on marine debris is one of top priorities for APEC economies, and articulated that the workshop was organized to echo and address the need for using innovative technology, and the necessity of international cooperation. He finally welcomed all the participants, both on-site and online, and stated that we will continue to facilitate collaboration to fight against the marine debris.

Subsequently, **Dr. Su-Fen Chen (Director General of NMMST, Chinese Taipei)** also pointed out the importance of knowledge sharing in the management of marine debris, and NMMST has been contributing to providing the space for the research and information exchange. She further concluded and welcomed everyone to visit the museum and Keelung City.

2.2 Keynote Speeches 1: From Source to Sink: The Innovative Technology of Monitoring and Modeling for Marine Debris

The first keynote speeches were given by Mrs. Patrycja Enet, and Dr. Keith Alverson. The title of Mrs. Patrycja Enet's speech is "Marine litter & plastic pollution - from source to sink." In her speech, she explained the impacts of marine debris and current international actions in a global context. She highlighted that the amount of marine debris is still rising as one of the biggest global challenges, which requires joint efforts and actions from every economy. With her experiences and works in the UNEnvironment Management Group, she also provided a series of information that UN has conducted many researches and actions, and stressed that the issue of marine debris must be managed through a comprehensive understanding of the lifecycle of marine debris. By examining the lifecycle of marine debris, several Sustainable Development Goals (SDGs) could be related and they could serve as the immediate references and guidelines for nations to formulate policies and solutions accordingly. Following the SDGs, there are 14 organizations in the UN assisting nations to develop action plans, and the international collaboration, talent cultivation, and engagement of every stakeholder via innovative technology are especially emphasized. Down to the regional scale, Mrs. Patrycja Enet explained that UN are working with member nations on the levels of state and city on the basis of different local contexts. She stressed again that the marine debris must be solved and researched by its lifecycle and in the global context, and the importance of international and regional collaborations, experience sharing, and public awareness. Finally, she concluded her speech by restating the importance of realizing the lifecycle of marine debris, and drawing attention to that only the sources of marine debris are identified, then we could truly face the challenge.

Followed by Dr. Keith Alverson's speech is "Plastic in the Ocean: Evaluating Solutions." In his speech, he started with his conclusions stressing that the ideal practice and measures should be based on the local context and targeted kinds of marine debris, and every municipality should have a holistic waste management system and policies and actions should be informed by quantitative and sustained research and monitoring results. In the following sharing, Dr. Keith Alverson utilized grades A, B, C, and D, to mark the solutions, from the grade D to A, containing the methods of cleaning beaches and oceans, alternative materials, regulations and treaties, waste to energy, research and monitoring, and holistic waste management. Among all the current solutions, the research and monitoring, and waste management based on Reduce, Reuse, and Recycle, are the most practical and feasible methods. He concluded that with the understanding, there are still four constraints of governance, economy, society, and technology to consider and overcome under different circumstances to achieve the vision of sustainable development.

2.3 Panel Discussion 1: Quantification of Marine Debris: Practice of Monitoring and Modeling in APEC Region

The first panel discussion was hosted by Dr. Jiahn-Horng Chen, who was joined by Dr. Kuo-Hsin Tseng, Mr. Cristian Enrique Brito Martinez, Ms. Hillary Burgess, and Dr. Jung-Yeul Jung.

Dr. Kuo-Hsin Tseng started his sharing by pointing out the traditional cleaning and monitoring was labor intensive and lack of efficiency, especially the issue of marine debris is affected by current and wave. His research focus was on using remote sensing to identify the categories and map the trajectory of marine debris. He further shared the adoption of UAV, cameras, and mobile devices in marine debris monitoring, and explained the collected images and footage could be later analyzed by AI models. He also introduced an APP which was developed in Chinese Taipei and would encourage citizens to join the monitoring actions.

A noteworthy fact was that Mr. Cristian Enrique Brito Martinez's contributions were acknowledged and appreciated via the abstract and conclusion due to technical difficulties. His presentation focused on using AI to detect marine debris, where the computers were leveraged to mimic the problem-solving and decision-making capabilities of the human mind. In marine debris detecting, the technology of deep learning and computer vision are adopted, and in Chile cases, the detecting accuracy could reach over 95% via training. Also, in Chile, the possibilities of combining the flight, all-terrain, and underwater UAVs were explored to overcome the difficulties that of arose from the long coastline or in remote places. He concluded that the AI could contribute to the management of marine debris in the APEC region, and even generate new ventures that contribute to environmental protection and economic development.

Ms. Hillary Burgess continued to share, and stated that the NOAA founded the Marine Debris Program within the Office of Response and Restoration in 2006 and has had six major strategy pillars: Prevention, Removal, Research, Emergency Response, Regional Coordination, and Monitoring & Detection. In the monitoring perspective, the U.S. government had continuously founded a coastal community to monitor with human-oriented methods, and had accumulated data for over 10 years, which would provide related toolsets, guidelines, and further analysis for the management.

Dr. Jung-Yeul Jung took Republic of Korea as an example. Since there are lots of remote islands and fragmented coastline, the remote sensing technology like UAVs and satellite images could help detect the marine debris and establish the models. He also added that the outcome and data were planned to upload to an open platform. He concluded that the marine debris poses a great threat on human and environment, and monitoring is the key to its solution, which could be improved by technology.

2.4 Demonstration of Application of Innovative technology in Marine Debris Monitoring

The fieldtrip is led by Dr. Kuo-Hsin Tseng, Dr. Jian-Wu Lai, Mr. Zheng-Xiong Zhang, the CEO of Dynamic Control Model Co., Ltd., and also the staffs of NMMST.

As the field trip group arrived at Chaojing Park, Dr. Jian-Wu Lai introduced the two latest stations established by NAMR of Chinese Taipei: X-Band Telemetry System and ChaoJing Data Buoy Station, for collecting the wind, waves data, and how they can utilize on marine technology governance.

After the introduction of monitoring stations, Mr. Zheng-Xiong Zhang explained the theory of monitoring, demonstration of the UAVs operation and how they assisted in debris images collection. In this part, participations also had access to operate the UAVs themselves. Lastly, Dr. Kuo-Hsin Tseng led the participants to use the APP developed by Center for Space and Remote Sensing Research via mobile phones on their own, to experience the real-time identification technologies of marine debris. Moreover, after the trip, whole group was back to meeting venue for an explication regarding the details, purposes and missions of this innovative technology.

2.5 Keynote Speeches 2: Best Practice- Regional Partnership on Action Plan of Marine Debris Monitoring

The second keynote speeches on the second day were given by Dr. Hsiang-Wen Huang, and Mr. Nicholas Mallos. Dr. Hsiang-Wen Huang's speech was entitled "Partnership on Marine Debris Monitoring and Cleanup Action Plan." In the first part, she explored the progress of the action plans, researches, and partnerships across both public and private sectors of Chinese Taipei since 2000. In 2018, Chinese Taipei government revealed the Marine debris governance Platform and Action Plan, and established the OCA, as the guiding plan and competent authority. She further explained the current five priorities for managing marine debris: Monitoring and Investigation, Marine Debris Removal, Recycling Pilot Program, International Cooperation and Promotion, and Marine Education and Advocacy. Following the brief of Chinese Taipei's progress, she highlighted current actions of monitoring and cleaning, and stated that the importance of partnerships among all stakeholders. Moreover, she also underlined the cooperation between government and civilians, including fisherman's association, fishers, civil scientists, divers, and related enterprises, and she also discussed how to promote initiatives for the engagement of private sectors. Based on the efforts of over 20 years, she emphasized that the education and international collaboration regarding marine debris are also top concerns of Chinese Taipei. She concluded that the

marine debris management of Chinese Taipei has arisen from non-governmental initiatives to scientific researches, primary policies of government, and international cooperation, and she once again stressed that the marine debris is a global issue which requires collaborations that goes beyond boundaries.

The title of Mr. Nicholas Mallos' speech is "Buildilng Capacity to Monitor and Prevent Marine Debris." He opened with the discussions on the importance of waste management, recycling plans, and cleaning projects, and he stressed that the APEC members are acting significant roles in the global context. Based on his experiences of organizing the International Coastal Cleanup, he extended the discussion to several key perspectives of fighting against the marine debris, including international collaboration, open and de-centralized data platform, and the meaning of monitoring. He further explained the connections between socio-economic status and marine debris, and provided a fact of significant number has increased of Personal Protective Equipment (PPE) in marine debris collected due to the COVID-19 pandemic, where he emphasized that the action plans and policies should be developed. Next, he introduced the GGGI[13], and with the example of GGGI's data sharing website and platform, he once again stressed the importance of marine debris monitoring, and the related guideline of surveillance, coordination, and data sharing. Finally, he concluded that the economies around the Asia-Pacific region are key actors of combating marine debris, and leading and coordinating the monitoring internationally.

2.6 Panel Discussion 2: Toward a Mutual Monitoring Platform of Marine Debris for APEC Region

The second panel discussion is moderated by Dr. Jason Kao, and the panelists are Dr. Jian-Wu Lai, Dr. Devi Dwiyanti Suryono, Dr. Jiraporn Charoenvattanaporn, and Ms. Nguyen Thanh Thao.

Dr. Jian-Wu Lai firstly pointed out four key elements in marine debris management: prevention, monitoring, cleaning, and modeling. And in view of marine debris is affected by rainfall, river runoff, ocean and atmospheric dynamics, he also stressed that the international cooperation is imperative. His research was mainly focused on the adoption of innovative technology on marine debris monitoring, and the related digital model building. He provided several examples and cases in Chinese Taipei, and demonstrated the modeling of surrounding ocean areas, on which he accentuated again the collaboration among APEC members to enlarge the monitoring and modeling in purpose of fully understanding and controlling.

[13] Global Ghost Gear Initiative

Dr. Devi Dwiyanti Suryono introduced the Indonesian action plan derived from a 2015 report, and a President Order was announced in 2018 to control and manage the marine debris. Currently, Indonesia's strategy includes behavior change, eliminating land and marine sources, legislation and budgeting, and research. As for the practice, she shared some examples of the field survey, modeling, remote sensing, and some simple methods based on in Indonesia. Finally, she concluded that the key principle for combating marine plastic debris is to prevent items from becoming debris in the first place, and the understanding based on scientific aspects is indispensable and helpful.

Dr. Jiraporn Charoenvattanaporn mainly shared the Marine Debris Programmes under DMCR in Thailand, including researches, monitoring projects, and removal and reduction plans. In research project, Dr. Jiraporn shared that the Thailand scientists are focusing on the impact of marine debris on marine mammals, coral reefs, and other marine creatures. In monitoring projects, based on Thailand’s geography and hydrology, the emphasis was laid on the estuaries. As for the removal actions, she shared that the achievements of continuous coastal cleanup and online data sharing. Lastly, she concluded with Thailand's 2030 plan focusing on plastic reduction and aiming for total plastic ban in 2027.

Ms. Nguyen Thanh Thao shared the experiences of marine litter monitoring in Viet Nam. Currently the approaches were based on international organizations and researches from scientists, and the monitoring methods were mainly human-oriented. She stressed that the difficulties of monitoring the long shorelines, and the importance of technology adoption in the future. In conclusion, she stated that the guidelines and survey data sharing are important but should be adjusted to the local context.

2.7 Closing Remarks

In the closing remarks, **Mr. Zih-Jia Li, the Section Chief of the Department of International Development, OAC, Chinese Taipei,** stressed the achievements of workshop, and the initiative and promises of Chinese Taipei. The workshop had been effectively constructed in two keynote speeches, two panel discussions, and a field trip, which recognized the importance of innovative technology in facilitating the management of marine debris. With more technical approaches incorporated into marine debris monitoring and modeling, long-term environmental sustainability can be achieved via international collaboration.

Moreover, he further highlighted the management of marine debris is a shared responsibility, which needs coordination and cooperation among all APEC stakeholders. On the basis of this workshop, Chinese Taipei will continue to work with all APEC members to focus more on the innovation of marine debris monitoring and modeling technology, and the

facilitation of regional collaboration. Finally, Mr. Li represented Chinese Taipei to express the heartfelt appreciation to APEC Secretariat and all OFWG members for supporting Chinese Taipei to organize this workshop, and the gratitude to speakers and participants for mapping a bright future for combating the marine debris in Asia-Pacific region.

3. Conclusions and Recommendations

The conclusions of the workshop are as follows:

- The solution of marine debris must be based on and adapt to the local conditions. The global success of marine debris management can only be reached on the foundation of regional and domestic actions.

- Marine debris issues should be confronted through the concept of lifecycle, and by examining the process, references and guidelines based on scientific researches will be able to assist nations to formulate policies and solutions accordingly.

- The marine debris can be identified and further calculated through remote sensing technology by utilizing the combination of satellites, UAVs, and AI models of deep learning and computer vision. The pattern of marine litter moved and affected by atmospheric, marine, hydrology, and geography factors, can be simulated and ultimately estimated through digital models. And these adoptions of innovative technology could help policy makers and frontline practitioners.

- Digital and de-centralized data platforms can provide real-time information, allow the government, Non-Governmental Organization (NGO), researchers, civil scientists, and every citizen in APEC economies to have the direct access to the information on the distribution and movement of marine waste, and as the reference and policy-making tools, to have the ventures to develop future solutions in the situation in specific regions.

- Innovative technologies allow us to detect and understand marine debris, and as many economies upload the monitoring and modeling data to online platforms, the core issue would be how to coordinate and integrate all the efforts, and extend to the international community for an open, comprehensive, and collaboration.

The recommendations of the workshop are as follows:

- Launch mechanisms or provide financial support for the innovation and adoption of technology in marine debris monitoring and modeling as stimulus factors.

- Create and conduct programs that promote contact or hands-on experience of schoolchildren or young people in the development of the awareness of marine debris issues, and in the education of utilizing technology to solve related problems.

- Promote activities or initiatives that seek to work on the development of skills, abilities, and willingness in private investors, entrepreneurs, and enterprises to enhance the monitoring capacity and public and private cooperation of APEC member economies.

- Urge APEC economies to make marine debris monitoring data available in a harmonized format as the data collected by different organizations nowadays are generally in different formats due to the diversity of local contexts. However, only with a higher tier of unification of these monitoring standards generated and followed, the efficiency and effectiveness of marine debris governance can be accelerated across the regions.

- Encourage APEC economies to formulate and establish a mutual marine debris monitoring and modeling data platform, for the purposes of building better management and greater capacity of marine debris management in both local context and whole Asia-Pacific region.

4. Annex: Final Agenda of The Workshop

Capacity Building on Marine Debris Monitoring
by Using Innovative Technologies in APEC Region

Date: 24th – 25th March, 2022

Time zone: GMT+8

24 March (Thur.)	
09:00–09:30	Registration and Reception (Online & On-Site)
09:30–09:40	**Introduction-Workshop overview and goals** • ***Dr. Jason Kao****, Associate Professor of Yuan Ze University (Chinese Taipei)*
09:40–10:00	**Opening Ceremony** • ***Dr. Ching-Piao Tsai***, *Deputy Minister of OAC (Chinese Taipei)* • ***Dr. Su-Fen Chen***, *Director General of NMMST (Chinese Taipei)*
10:00–11:00	**Keynote Speeches 1: From Source to Sink: The Innovative Technology of Monitoring and Modeling for Marine Debris** • ***Mrs. Patrycja Enet****, Expert Consultant of UN Secretariat of the Environment Management Group (France)* • ***Dr. Keith Alverson****, Former Director of International Environmental Technology Centre, UNEP & Independent Consultant (The United States)*
11:00–11:10	**Coffee Break**
11:10–12:30	**Panel Discussion 1: Quantification of Marine Debris: Practice ofMonitoring and Modeling in APEC Region** • ***Dr. Jiahn-Horng Chen (Moderator)****, Vice President of NAMR, OAC (Chinese Taipei)* • ***Dr. Kuo-Hsin Tseng****, Associate Professor of Center for Space and Remote Sensing Research, NCU (Chinese Taipei)* • ***Mr. Cristian Enrique Brito Martinez****, International Affairs Office of Ministry of Environment (Chile)* • ***Ms. Hillary Burgess***, *Monitoring Coordinator of Office of Response and Restoration, NOAA (The United States)* • ***Dr. Jung-Yeul Jung****, Principal Researcher of KRISO (Republic of Korea)*
12:30–13:30	**Lunch Break**
13:30–17:00	**Demonstration of Application of Innovative technology in Marine Debris Monitoring**

25 March (Fri.)	
09:00–09:30	Registration and Reception (Online & On-Site)
09:30–09:35	**Introduction-Workshop overview and goals** • ***Dr. Jason Kao****, Associate Professor of Yuan Ze University (Chinese Taipei)*
09:35-10:25	**Keynote Speeches 2: Best Practice- Regional Partnership on Action Plan of Marine Debris Monitoring** • ***Dr. Hsiang-Wen Huang****, Director General of OCA, OAC (Chinese Taipei)* • ***Mr. Nicholas Mallos****, Senior Director of Trash Free Seas® Program, Ocean Conservancy (The United States)*
10:25–10:40	**Coffee Break**
10:40–12:00	**Panel Discussion 2: Toward a Mutual Monitoring Platform of Marine Debris for APEC Region** • ***Dr. Jason Kao (Moderator)****, Associate Professor of Yuan Ze University (Chinese Taipei)* • ***Dr. Jian-Wu Lai****, Research Fellow of Marine Industry and Engineering Research Center, NAMR, OAC (Chinese Taipei)* • ***Dr. Devi Dwiyanti Suryono****, Senior Researcher of Marine Research Center, Ministry of Marine Affairs and Fisheries (Indonesia)* • ***Dr. Jiraporn Charoenvattanaporn****, Fishery Biologist & Director of Academic and International Research Division, DMCR (Thailand)* • ***Ms. Nguyen Thanh Thao****, Acting Director of Department of Geology and Minerals of Vietnam, MONRE (Viet Nam)*
12:00–12:10	**Coffee Break**
12:10–12:30	**Closing Ceremony**