



**Asia-Pacific
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Promoting Innovative Models in Reducing and Managing Land-based Debris into Oceans for Sustainable Development

APEC Ocean and Fisheries Working Group

October 2021



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Economic Cooperation**

Promoting Innovative Models in Reducing and Managing Land-based Debris into Oceans for Sustainable Development

Workshop Summary Report

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APEC Ocean and Fisheries Working Group

October 2021

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INTRODUCTION

On 27 – 28 July 2021, the *APEC Workshop on Promoting Innovative Models in Reducing and Managing Land-based Debris into Oceans for Sustainable Development* was held *virtually*, co-sponsored by Australia; Chinese Taipei; Chile; Indonesia; Japan; Malaysia; Peru; Philippines; Singapore; Thailand. The Workshop was held under the APEC Ocean and Fisheries Working Group with a view to contributing to the implementation of the APEC Viet Nam 2017 Joint Ministerial Meeting commitments and the APEC Roadmap on Marine Debris, which is aimed at encourage member economies to take voluntary and concrete steps mitigate the impediments of marine debris to sustainable economic growth in the Asia-Pacific..

The Workshop gathered about 200 participants, including representatives of related ministries, agencies, experts, scholars, enterprises from APEC member economies, representatives of APEC Ocean and Fisheries Working Group (OFWG) and Policy Partnership on Science, Technology and Innovation (PPSTI),and representatives of international organizations such as World Bank, UNESCAP, UNEP, IUCN. The Workshop was opened by the Remark from Ms Alicia GALLARDO, Lead Shepherd of the OFWG.

The main objective of the Workshop was to contribute to APEC efforts in protecting our oceans from land-based debris through maximizing the benefits of marine technological innovations as well as advancing the sustainable growth in the region. For that, the project was designed to: (i) Build the capacity of economies through sharing experiences and best practices among participants (governments, experts, businesses, global and regional organizations...)in harnessing new technologies to address effectively the APEC-wide issue of marine debris; (ii) Develop a set of recommendations to improve waste management measures (generating – using – recycling and disposing processes; clean-up programs...) and prevent the entrance of land-based marine debris into oceans; (iii) Identify cooperation areas and promote collective actions on marine conservation through setting a multi-stakeholder network among project participants.. Recommendations will be reported to related sub-foras to contribute to the implementation of the APEC Post-2020 Vision.

KEY ISSUES DISCUSSED

The Workshop was opened by the Remark from Ms Alicia GALLARDO, Lead Shepherd of the OFWG.

The two-day workshop was then divided into four sessions.

SESSION 1

The First Session on “Land-based Marine Debris – A global Challenge to Sustainable Development” was chaired by Dr Deborah Lau, Ending Plastic Waste Mission Lead of CSIRO’s Oceans and Atmosphere, Australia.

Ms Kamala Ernest, Project Coordinator for the Project SEA Circular, UNEP Asia and the Pacific Office presented the challenges and impacts of Land-based Marine Debris as well as UNEP’s role and initiatives in addressing marine debris.

According to Ms Kamala Ernest, from the 9200 million tons of primary plastic produced during the period 1950 – 2017, 76% have been converted into plastic waste, approximately 75 – 299 million tons of plastic, which represents 85% of marine debris, have entered into the ocean. If the current unsustainable consumption and production practices are not changed, we are looking to accumulate about 710 million tons of plastic waste in the oceans in the next 20 years.

Ms Kamala Ernest has presented the direct risks, as well as biological, economic and social impacts of marine debris and plastics pollution. She has also emphasized that the efforts to reduce marine debris is not significant comparing to the impacts and the economic value of the marine ecosystem service to mankind, which is valued at about 500 to 202,500 billion USD.

To address the marine debris challenge, Ms Kamala Ernest highlighted the crucial role of collective efforts, involving governments, private sector, public sector, individuals as this is a large-scale trans-boundary problem. She has recommended four approaches:

- To pursue inclusive and sustainability considerations; to look at the lifecycle approach to reduce the impact assessment and analysis; incorporate gender equality and especially for the informal sector, who are also part of the supply chain in addressing the problem; to adopt the circular economy approach.
- To enhance political commitments and to have the right market incentives, the legislation, the legal framework, policies, strategies, as well as budget allocations.
- To promote behavioral change, to arise awareness, to have effective communication, and to promote consumer demands for better goods and services that are environmentally friendly.
- To look at the value chain side, the packaging sector, which is creating the largest impact; the whole plastic value chain recycling, sorting; sustainable consumption and production practices.

At last, Ms Kamala Ernest emphasized the three areas of UNEP's role and priorities in the context that the COVID-19 pandemic has offset a lot of gains and benefits that has been done over the years:

- *Reinforcing circularity approach in the plastics value chain* through partnerships with businesses for continued push for singularity; incentive models to support businesses and social enterprises to measure and report on their plastic footprint; a lifecycle approach, especially for the single use plastic; advocacy and sector initiatives
- *Strengthening science and data for informed decision making*, this is the mandate of UNDP as they are continually updating and also presenting information to support member economies. The UNEP has been focusing recently on developing hotspot assessment, plastic leakage assessment, and material flow analysis, to inform and incentivize circularity to address plastic pollution in the pandemic environment.
- *Addressing plastic pollution in the pandemic environment* as the COVID-19 pandemic has contributed to the surge in volume of waste produced and ended up as marine debris, especially in coastal areas. In this area, the UNEP have been focusing on reigniting actions, efforts and behaviors on plastic waste reduction and disposal; promoting technologies and also digital solutions to facilitate the transition to less plastic waste in the future; promoting innovative financing mechanism to unlock investment for a new plastic economy; promoting campaigns and key messaging.

Mr Ashraf El-Arini, Environmental Specialist of the World Bank presented the impacts of COVID-19 on plastics pollution and how the pandemic has highlighted the urgency for addressing the issue.

Mr Ashraf El-Ariniem phasized that the COVID-19 pandemic has added a new dimension to the already complex task of addressing plastic pollution.

- The surge in Personal Protective Equipment and Medical waste have been adding pressure to the Waste Management System, which has also become an essential service for every economy, especially in East Asia, the current epicenter of plastic pollution with many developing economies lacking effective waste management system.
- Waste pickers have been facing increased vulnerability loss of livelihood with the higher risk of exposure to the virus.
- Behavior and consumption patterns have shifted due to hygiene concerns
- Recycling markets have been disrupted. Consumer demand for recycled and reusable products has decreased as Virgin plastic has become cheaper.
- Efforts to transition to circular economy have been halted during lockdowns.

Urgent global actions are therefore required now more than ever to protect and safeguard the environment. However, solutions would need to consider the local context to:

- Identify the entry point of exacerbated plastic waste in the environment,
- Tackle the problem from both an investment point of view by improving Solid Waste Management and recycling through investment in facilities, as well as from a policy standpoint through solid waste management reforms, economic and financial instruments such as taxes, fees, regulations and enforcement instruments such as bans recycling and target recycling targets and sanctions as well as behavioral nudges, such as improved awareness raising and labeling.

In the business as usual scenario, even without the pandemic, The Ocean Conservancy has estimated that plastic consumption would grow by 50% by 2025, with 250 million metric tons of plastic waste potentially in the ocean in fewer than 10 years; The World Bank has estimated that waste generation will grow by three times in low income economies by 2050.

The plastic pollution is having an economic impact, with environmental costs of plastics estimated at \$35 billion per year; an impact on ecosystems with at least 700 marine species ingesting micro plastics with \$13 billion downstream costs to marine ecosystem, as well as on people and livelihood.

To address this challenge, the World Bank has been supporting economies to build black bluer and cleaner, by incorporating plastic pollution mitigation efforts in COVID-19 recovery support packages with a 3 points approach:

- Stop leakage multisector by supporting economies to prioritize Solid Waste Management as an essential public service and recovery plan.
- Create circular economy, which requires addressing the drivers of unsustainability through policy instruments and fiscal mechanisms, including potentially through repurchasing subsidies, and building complimentary public and private investments into post COVID recovery plan. Innovations, technologies, financing as well as public and private interventions from multiple angles are crucial in this approach.
- Supporting ecosystem restoration that requires an emphasis on restorative restoring livelihoods in a sustainable and inclusive way.

Mr Cristian BRITO from the Ministry of the Environment of Chile presented how Chile has successfully applied Artificial Intelligence techniques, with Computer Vision and Deep Learning to detect Marine Debris in remote locations, which is a very difficult and expensive task.

Mr Cristian Brito explained that Deep Learning and Computer Vision are branches of

Artificial Intelligence where mathematical algorithms are capable of automatically detecting and extracting characteristics of the data. To achieve this goal, they have to use hundreds of images to teach the system how to detect and identify Marine Debris. The developed AI model is also combined with unmanned aerial vehicles (UAV), unmanned underwater vehicle (UUV) or other devices to detect Marine Debris faster and at a lower cost. The developed model has the accuracy which is greater than 95%.

Dr Britta Denise Hardesty, principal research scientist for CSIRO's Oceans and Atmosphere talked about CSIRO's approaches to quantify plastic and other waste, as well as the need to focus on timely, relevant solutions that are scalable and socially, culturally, economically, environmentally place-based appropriate.

To achieve this goal, Dr. Hardesty has shared the four main drivers of debris loads, which consist of (i) the characteristics of urbanization; (ii) the land use; (iii) the socio – economics factors, as a higher employment rate often leads to lower plastic waste in the area; (iv) the site type which links to land use.

Dr Hardesty emphasized the need for information and data in order to identify the most appropriate decision with the best available tools. She presented then three approaches by CSIRO:

- A Statistically robust sampling approach for Inland, Coastal, River and At-sea sites to identify the main sources and hotspots of wastes, measure and predict the level of waste as a whole or at each site.
- To use cameras and artificial intelligence with machine learning to be able to quantify and identify plastic that's moving through the waterways, which will allow to get much larger scale data more quickly and more efficiently.
- To place sensors at storm water drains or gross pollutant traps.

To promote the monitoring of waste inputs and the evaluation of existing and potential responses at regional and global level, Dr. Hardesty suggested to develop and improve the standardization or harmonization of data collecting approaches, with a view to establish a centralized data sharing system or platforms which will enable us to have a holistic perspective on how well different policies and solutions have been adapted in different economies or regions.

Dr Hardesty also highlighted the importance of shifting our view from treating plastics as waste to a commodity as we have been witnessing an increase in different approaches towards waste innovation, incentives to change people's behaviors, revolutionizing in the packaging sector and focus on best practices or standards.

SESSION 2

The Second Session on "Best Practices and Success Stories in Reducing and Managing Marine Debris in the Asia – Pacific" was chaired by Ms Kamala Ernest, Project Coordinator for the Project SEA Circular at the UNEP Asia and the Pacific Office.

Ms Kwan Pei Ying, Researcher at the Plastic Industry Development Center (PIDC), one of the main non-state actor in the Chinese Taipei, presented how non-state actors and private actors can play a crucial role in promoting the circular economy, managing marine debris and raising awareness of the public on marine plastic pollution.

PIDC was established in 1993 and voluntarily established Ocean Plastic Coalition (OPC) in 2018. PIDC-OPC has gathered industrial partners, from recycling factories, product manufacturers, Brands & Marketing companies to promote a circular economy by turning

ocean plastic into consumer products.

Ms Kwan Pei Ying presented 4 consumer products recycled from marine debris in the Chinese Taipei: Fountain Pen from Styrofoam and PET bottle with the look of Black-faced spoonbill to raise awareness to protect the endangered species, Ocean Plastic Bag made of 100% recycled plastic, the frame of Ocean Plastic Sunglasses made of 100% recycled fishnets, and Recycled Coasters in collaboration with local academic institutions.

Ms Kwan Pei Ying also shared that to achieve Zero-Waste Ocean System, we have to focus on six core subjects: Fishing Activity, Marine Ecology, Human Health, Collecting System, Product Design, and Ocean Cleanup for the protection of coastal and marine ecosystems.

Ms Michelle Tan, Executive Engineer, Department of Sustainability Strategy, National Environment Agency of Singapore talked about the Singapore's Sustainable Management of Packaging Waste including Plastics.

Firstly, Ms Michelle Tan shared an overview of Singapore's national waste management targets. In February 2021, the Singapore Green Plan, a sustainable movement with ambitious and concrete sectorial plans and targets over the next 10 years, has been launched with a view to achieving long term net zero emissions as soon as viable. The five pillars of the Green Plan are City in Nature, Sustainable Living, Energy Reset, Green Economy, Resilient Future. The green plan is a living plan, which will evolve as Singapore develops and refines its strategy, and to take into account technological development as part of a continuous engagement process.

Ms Michelle Tan also presented the Zero Waste Master plan of Singapore, which laid out Singapore's key strategies, including the adoption of a circular economy approach to waste and resource management practices, and shifting towards more sustainable production and consumption, with the aim to build a sustainable, resource-efficient and climate-resilient economy. The targets of the Master plan consist of: (i) Extending Semakau Landfill's lifespan beyond 2035; (ii) Reducing the amount of waste sent to landfill per capita per day by 20% by 2026, and 30% by 2030; and (iii) Achieving a 70% overall recycling rate by 2030.

Ms Michele Tan highlighted that the key priority waste streams are (i) Packaging Waste, including Plastics; (ii) Food Waste; (iii) E-waste, which could have detrimental effect on the environment if electronics are not properly managed.

Secondly, Ms Michelle Tan shared some initiatives that have been introduced or will be launched in the upcoming years in Singapore.

- *The Mandatory Packaging Reporting*, which requires producers of packaged products, and retailers, such as supermarkets, with annual turnover of more than 10 million, is required from 2021 to submit annually packaging data and plans to reduce reuse or recycle packaging.
- *The Packaging Partnership Programme (PPP)*, launched in 2021 with the objectives to (i) Build up industry capability to reduce, recover and recycle packaging waste; (ii) Introduce supply chain initiatives that foster the sustainable use of resources in packaging; and (iii) Raise industry and community awareness on 3Rs of packaging waste.
- *The Extended Producer Responsibility (ERP) scheme*, which require producers to be financially and/or physically responsible for the collection and recycling of the materials they use to package their products. This scheme will help raising producers' responsibility for the end-of-life management of the packaging they place on the market, increasing recycling rates and reducing waste sent for disposal.
- Singapore will be introducing in 2022 the legislative framework for a *beverage*

containers return scheme as the first phase of EPR for packaging waste management. This scheme will then be implemented in **2023** after a 1 year transition period for the industry and consumers. The National Environmental Agency of Singapore has been engaging the community and industry through surveys, focus group discussions and requests for information to develop the framework and will continue to consult public industry stakeholders in the coming months.

Lastly, Ms Michelle Tan presented Singapore's efforts to enhancing Recycling Capacities. On the one hand, Singapore has been using Mechanical Recycling (MR) plants to treat post-industrial plastic waste and future post-consumer plastic waste aggregated from the beverage containers return scheme. On the other hand, Singapore has also been pursuing chemical recycling solutions to treat plastics, which are not suitable for mechanical recycling, such as contaminated plastic bags, and other single use plastic.

Singapore has been working closely with other governments and industry partners to look into establishing a pilot plan that will contribute to and help anchor the chemical recycling value chain in Singapore within the next few years. The diversion of plastic waste away from incineration will help reduce greenhouse gas emissions.

The NEA has also been studying on the pilot Plastic Recovery Facility which has been extracting plastics suitable for chemical recycling from domestic waste, then sent to a pyrolysis plant to be chemically recycled, converted into pyrolysis or the pyrolysis oil, then fed into petrochemical plants, which in turn can be used by manufacturing plants to create new plastic products for the economy.

Engr Vizmina Osorio, OIC-Assistant Director, Environmental Management Bureau – Department of Environment and Natural Resources of the Philippines presented the National Plan of Action for the Prevention, Reduction and Management of Marine Litter (NPOA – ML) in the Philippines. With the vision of having “*A Philippines free of marine litter through shared responsibility, accountability and participatory governance*”, the overarching goal of the NPOA – ML is to have “*Zero waste to Philippine waters by 2040*”.

The NPOA – ML have been clustered into programmatic cluster which are consisting over six strategies and cross-cutting cluster which are consisting of for study strategies of action.

The six programmatic clusters are: (i) Establish science- and evidence-based baseline information on marine litter; (ii) Mainstream circular economy and sustainable consumption & production initiatives; (iii) Enhance recovery and recycling coverage rates and markets; (iv) Prevent leakage from collected or disposed waste; (v) Reduce maritime sources of marine litter; (vi) Manage litter that is already existing in the riverine and marine environments.

The four cross-cutting clusters are: (i) Enhance policy support and enforcement for marine litter prevention and management; (ii) Develop and implement a strategic and targeted social marketing and communications campaign using various media; (iii) Enable sufficient and cost-effective financing and other institutional resource requirements for the implementation of the NPOA-ML; (iv) Strengthen local government units' capacities and local level implementation of NPOA-ML.

Regarding the Implementation Framework, the government of the Philippines, through the Department of Environment and Natural Resources, intends to mobilize existing interagency bodies, commissions, councils, or boards to pursue the implementation of its actions, including fund matching, pilot demonstration, replication and up scaling. Monitoring and Evaluation will be linked on to the existing platforms of the agency's concerns. The updating of the Information will be at least every five years or when there are developments in the legislation and international agreements.

Engr Vizmindia Osorio also shared some challenges and potential areas of cooperation: (i) Lack of infrastructure to address land-based pollution; (ii) High dependence on unnecessary single-use packaging by low-income class, i.e. retail economy; (iii) High inter-island transport costs; (iv) Limited financial resources viz. increasing waste generation rate; (v) Barriers to private sector investments and participation for municipal solid waste management and technological solutions; (vi) Opportunities for circular economy approaches and regulations; (vii) Opportunities for post-pandemic green economic recovery.

Assoc. Prof. VU Dinh Hieu, Hanoi University of Mining and Geology, Viet Nam presented the Action Plan of Viet Nam on Minimizing Marine Plastic Debris and the plan to establish an International Oriented Center for Marine Plastic Debris.

Firstly, Assoc Prof Vu Dinh Hieu shared the current status of plastic waste in Viet Nam. According to the statistics of 2018, Viet Nam generates 0,76 kg/capita/day of solid waste, with 42% of them are mismanaged (5% was leaked into waterways, 28% was burned in open space, 7% remained on land and 2% remained littered).

Secondly, Assoc Prof Vu Dinh Hieu presented the Action Plan of Viet Nam for Ocean Plastic Waste Management by 2030 which will involve many Vietnamese ministries, People's Committees and organizations. By 2025, Viet Nam envisions to reduce 50% of plastic waste on the sea and oceans; 50% of lost or discarded fishing gear is collected; 80% of tourist areas, destinations, tourist accommodation service providers and other tourist services in coastal areas do not use disposable plastic products and plastic bags that are difficult to decompose; ensure at least twice a year to launch a campaign to collect and clean beaches across the economy; 80% of marine protected areas are free of plastic waste; carry out annual and biannual monitoring to assess the current status of ocean plastic waste in some estuaries of 5 major river basins in the North, North Central, Central and South Central regions, The South and the islands with potential for tourism development in 12 island districts. By 2030, Viet Nam envisions to reduce 75% of plastic waste on the sea and oceans; 100% of fishing gear lost or discarded is collected, ending the disposal of fishing gear directly into the sea; 100% of tourist areas, destinations, tourist accommodation service providers and other tourist services in the coastal areas do not use disposable plastic products and difficult-to-biodegrade plastic bags; 100% of marine protected areas are free of plastic waste; expansion of annual and regular monitoring every 5 years to assess the current state of ocean plastic waste in some estuaries of 11 main river basins and in 12 island districts.

The Action Plan has set out 5 main solutions:

- Propagating, raising awareness, changing behaviors and dealing with plastic products and ocean plastic waste;
- Collecting, sorting, storing, transporting and disposing of plastic wastes and waste from activities in coastal areas and at sea;
- Controlling plastic waste from sources;
- International cooperation, scientific research, application, development and technology transfer of ocean plastic waste treatment;
- Investigating, surveying, reviewing, researching and building a mechanism for managing plastic waste from the ocean to ensure consistency, uniformity, effectiveness and efficiency.

Lastly, Assoc. Prof. Vu Dinh Hieu presented the ambitious plan of Viet Nam to build an Orientated International Center for Marine Plastic Debris with a view to promote: (i) Implementation of Viet Nam's initiatives and commitments in international frameworks; (ii) law enforcement on managing, aggregating resources, protecting the environment;

- (iii) International integration in solving the problem of ocean plastic litter pollution;
- (iv) Capacity in preventing, minimizing and managing ocean plastic litter.

During the 2020 – 2021 period, Viet Nam has: (i) formulated and built organizational structures and legal provisions; (ii) received a system of equipment for investigating, surveying, analyzing and testing plastic waste, sponsored by the Japanese government; (iii) organized international seminars/conferences, establish relations with international organizations, such as World Bank, WWF, UNDP,... and developed economies; (iv) established website, database system.

In the next coming years, the goals will be to (i) continue promoting cooperation with other economies and international organizations; (ii) continue projects to investigate, survey and analyze plastic waste; (iii) announce the national plastic waste database annually.

SESSION 3

The Third Session on Exploring Innovative Solutions in Addressing Marine Pollution from Land-based Debris was chaired by Ms Janet Salem, Economic Affairs Officer of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), with speakers from Japan, Peru, Indonesia and Korea.

Mr Fujio Kojima, CEO of Pirika, Inc, a startup from Tokyo Japan which is developing innovative solutions to tackling the problem of waste, specifically the leakage of plastics into the environment from three different angles: (i) Developing Pirika application, the world's largest waste cleanup social media platform; (ii) Addressing urban waste by developing Takanome, the Urban Litter Survey mapping service which tracks litter distribution through AI and Smartphone; (iii) Tackling waste in rivers and oceans with Albatross, the micro plastics survey system which has been successfully deployed in many economies.

First, the Pirika application has successfully created a global movement with users from 108 economies sharing pictures of how the litter has been picked up. The compiled Waste Cleanup database will be used to identify, classify products or brands leaked into the environment, and develop targeted solutions.

Second, the Takanome mapping service creates a heat map showing relatively the concentration of urban litter. The quantitative data is used by the Japanese government and organization to decide on how to spend their cleanup budgets. Recently, the client base of Pirika has been expanded to the private sector, mainly tobacco and beverage companies.

Thirdly, the Albatross a low cost device which can be used anywhere, even in narrow rivers and canals to collect micro plastics. This high technology-solution, associated with others analytic solution, including the mass cloud calculation method, and with the collaboration from Japanese universities and plastic processing companies, has identified many sources of leakage. With the collected quantitative database, Pirika aims to develop alternative solution for each industry, change the mindset of consumer and companies, enable discussion and policy decision, generation of new businesses in the recycling industries. Pirika is actually collaborating with UNICEF and many other economies, especially in South-east Asia in the field of micro plastic treatment by disseminating the Albatross technology.

Ms Patricia Villasante, General Coordinator of the General Directorate of Fisheries and Aquaculture Environmental Affairs of the Vice Ministry of Fisheries and Aquaculture of the Ministry of Production of Peru, shared the comprehensive top down macro-level approach of Peru's policies on circular economy with a view to improving waste disposal through new recycling technologies. This approach highlights the importance of inter-ministerial cooperation and sub-national cooperation with provinces to achieve a common goal

At national level, Peru has implemented the *Integral Management on Solid Waste* which aim to: (i) Preventing or minimizing the generation of solid waste at source as primary purpose; (ii) Recovering and recycling if waste is generated; (iii) Disposal of solid waste in their respective infrastructure as the last alternative for waste management and must be carried out in appropriate environmental conditions.

Furthermore, Peru is currently working on two Roadmap towards a Circular Economy, one Roadmap in the Industrial Sector which focus on creating incentives for the use of useable waste in the value chain, developing guidelines on waste management and recovery activities; and the other Roadmap in Fisheries and Agricultures which aims to guarantee the sustainable use of resources and create incentives to use more productive system with the use of technological innovation. In her presentation, Ms Villasante showed an example of how Peru used local recycling technology to turn fishing nets into other products, such as sunglasses, skateboards, clothing...

At municipalities level, Peru promotes the recovery of solid waste by incentive programs “Source segregation and selective collection” with the participation of 745 municipalities.

Finally, the government of Peru has been working closely with the private sector, non-governmental organizations and academies to carry out environmental education campaign such as Clean Peru, Safe Beaches and Less Plastic, and Our planet is not for single use do tackle the surge in the use of disposable mask due to the COVID-19 pandemic.

Dr Handy Chandra, Senior Researcher from Marine Research Center, Ministry of Marine Affairs and Fisheries, Indonesia shared the Marine Debris Management Model of Indonesia, an economy with more than 10 thousands habited island, 70% of the territory consists of sea water, and about 20% of land consisted of wetlands, rivers, lakes and daMs With a view to implement the Presidential Regulation 83/2018 on Marine Debris which set out the objective to reduce 70% of Marine Debris in 2025, Indonesia have established an inter-ministerial Action Plan on Marine Debris Handling led by the Minister for Maritime Affairs and Investment and the Minister of Environment and Forestry. The Action Plan has five strategies: (i) National Movement to Increase the Stakeholders Awareness; (ii) Land-based Waste Management; (iii) Waste Management in the Coastal and Marine Area; (iv) Funding Mechanism, Institutional-Strengthening, Monitoring and Law Enforcement; (v) Research and Development. The Fifth strategy is the area that Indonesia wished to cooperate with other economies.

Dr Chandra also emphasized the importance of collaboration amongst stakeholders, between local government, international organizations, and the private sector, especially large companies.

Furthermore, a lot of successful stories, experiences and good practices has been shared by Dr. Chandra, especially the implementation in small islands (Seribu and Karimunjawa Islands).

To further leverage the efficiency of Land-based Waste Management in Indonesia, Dr Chandra’s Recommendations cover two aspects: the technical aspects and the strategic aspects. Regarding the *technical aspects*, Dr. Chandra recommends 3 programs: (i) The waste to energy programs such as Rules-based Financing, gasification and incineration plan; (ii) Expanding the 3R program (3 government regulations, including Waste Minimization, Waste Handling, and Waste Specific Management); (iii) Continuous awareness programs of marine debris disastrous impact to ecosystem. Regarding the *strategic aspects*, Dr. Chandra recommended continuing fostering collaboration among stakeholders and coordination in implementing special program.

Finally, to address the problem of waste in small islands, Dr. Chandra recommended using

a small group of incinerator vessels which will be guided by a command center.

Dr. Jonghwa Won, CEO of Foresys Co., Ltd, a leading company from the Republic of Korea which is specialized on developing innovative and smart solutions to handle the marine environment problem since 2017. Foresys's works focus on (i) Marine Waste Management; (ii) Marine Waste Pre-treatment; and (iii) Up cycling Marine Debris.

Firstly, on Marine Waste Management, Foresys develops two solutions: the River-based Floating Debris Blocking Platform and AMEIS. The first one consists of a Floating Barrier which prevents the leakage of land-based debris into the ocean, even after natural disasters. This Floating Barrier is much more cost-efficient than Clean-up vessel. The second solution, AMEIS, is a Smart Marine Waste Management System which monitors, collects and analyses big data 24/7 of marine waste on rivers and littoral facilities or.

Secondly, on Marine Waste Pre-treatment, Foresys develops Fore-sonic, a mixed frequency based ultrasonic cleaning solution for deep and fast cleaning without chemicals with minimum negative impact on the environment.

Thirdly, on Upcycling Marine Debris, Foresys has been involving in many mega-recycling projects, and the company's flagship program is the Eco-mooring system which transforms recycled materials, such as fishing net and oyster shells into mooring anchors and artificial reefs.

Finally, Foresys have been in active collaboration with the Government of Korea in many research programs focusing on waste management and resource circulation.

SESSION 4

The fourth Session on "APEC Post-2020 Vision: New Partnership for Sustainable Oceans" was chaired by Dr. Handy Chandra, Senior Researcher from Marine Research Center, Ministry of Marine Affairs and Fisheries, Indonesia, with speakers from the IUCN, the World Bank and the UNESCAP.

Ms Bui Thi Thu Hien, Marine and Coastal Program Coordinator, Office of the International Union for Conservation of Nature (IUCN) in Viet Nam presented the IUCN's Close the Plastic Tap Program, which has been deployed in 14 economies, 6 regions with a view to analyze the scale and impact of plastic pollution at national and regional levels. Since 2014, the IUCN has been building a solid portfolio of Knowledge Base on plastic pollution in its global strategy which aims to reduce plastic leakage into the environment by: (i) Informing and influencing public policy, corporate policies and operations; (ii) Developing knowledge products (methods, assessments, synthesis, etc); and (iii) Influencing and aligning stakeholders.

The main objectives of the Close the Plastic Tap Program consist of: (i) Collect data and analytics with a view to develop, and mainstream tools underpinning the global state of knowledge on plastic production and impacts; (ii) Developing economic and policy assessments which determine and assess demand-responsive plastic abatement actions; (iii) Set standards to develop consistent assessment methodologies that can be replicated; (iv) Engage the private sector; (v) Transformational actions to address the full plastics value chain.

Ms Bui Thi Thu Hien has also presented how the Global strategy of IUCN has been transformed into concrete actions in Viet Nam.

Ms Anjali Acharya, Senior Environmental Specialist from the World Bank presented the World Bank's projects on addressing marine plastics with focus on the East – Asia Pacific, considered as the regional Hotspot for Plastic Leakage. According to the statistics of the World Bank, 90% of global marine plastic pollution is estimated to come from just 10

rivers, 8 of them is in Asia; ASEAN is projected to have the largest share of mismanaged plastic waste by 2025 in East – Asia Pacific (31,64%), surpassing China.

The World Bank's work is based on a value chain approach. They start from working on the upstream analytics in terms of plastic diagnostics, policy reforms, looking at different option for finance, different alternatives for technology. In the mid-section, the World Bank focuses on Solid Waste Management work in terms of collection, sorting and disposal. However, the World Bank is now increasingly moving towards Plastic Circularity. At the downstream, the short term measures with quick results will consists of investments on cleaning up rivers, shorelines and reservoirs. The World Bank strongly believes that the more upstream we work, the more effective it will be in the long term.

Apart from the work on analytics with many economies in the East - Asia Pacific, the World Bank is also collaborating with other partners, including international organizations to conduct regional studies. One of the completed work is the *Toolkit for Suitability of Plastic Pollution Methodologies*, which help economies to decide which kind of methodology is best suited for them.

Ms Anjali Acharys emphasized the increasingly important role of innovative technology. Therefore, we need to bring in the private sector, especially in plastic recycling, because if we works only with the public sector, as the World Bank did traditionally, the result will only be a partial solution. We need to create an enabling environment conditions to attract the private sector to join the domain by realizing its business opportunities. Ms Anjali Acharys also stated that “plastic was considered as an innovation more than 100 years ago, and indeed, it is going to be innovation that takes us out of this plastic mess”.

At regional level, the World Bank has worked with ASEAN to develop the ASEAN Regional Action Plan to Combat Marine Debris with a set of 14 actions.

The World Bank have also been in close collaboration with many developing partners, including other international organizations, to synchronize their work in the region. They are inviting partners to collaborate in their new program, Southeast Asia Regional Program on Combating Marine Plastics (SEA – Map) which support all ASEAN economies through grant financing and parallel financing with the target of about 40 million USD. The project components are essentially threefold: (i) Strengthen Institutions and Regional Policies for Plastics Circularity which aims to achieve a regional harmonization of policies; (ii) Supporting Public and Private Sector Innovation and Actions for Plastics Circularity, focusing on identifying large scale and catalytic innovative solutions that can show immediate impact and replicate across the region quickly; (iii) Project Management, which will support strengthening of ASEAN for project and financial management, and bolster capacity to administer grant program.

Ms Anjali Acharys finished her presentation by reiterating that our knowledge about the plastics and the solutions to tackle the plastic pollution are well known. What we must be seeking now is to bring to the front the good practices and lessons that can be replicated across the region, adjusting and adapting to different plastic contexts.

Ms Janet Salem, Economic Affairs Officer from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) talked about how stepping up regional efforts and policy dialogues is crucial in the fight to prevent marine debris from land and sea-based activities.

Ms Janet Salem is convinced that the duplication of efforts is not bad as the issue will be tackled in different angles. However, bringing together the lessons learned, methodologies, technological solutions, information by fostering regional cooperation will be key to enhance the efficiency of projects. Therefore, Ms Janet Salem called others stakeholders, especially

international organizations, to join hands by harmonizing methods and approaches, which consist of developing common conceptual frameworks, common definitions, common platforms for information, stepping up regional efforts in projects.

The UNESCAP's work is basically focused on dealing with Urban plastic pollution, which has greatly contributed to a growing environmental crisis in ocean and freshwater systems due to the abundance of plastic, coupled with poor waste management.

The UNESCAP's projects in ASEAN cities have two objectives. First, they seek to build a good evidence base by promoting the use of innovation and smart technology on measuring and monitoring plastic pollution. Then, they work with cities to manage the plastic pollution through policy and investment strategies or cities' action plans.

The UNESCAP believe that domestic policies are indeed important, but need to be complemented by cities' policies and action plans as they are at the frontline and tackling plastic pollution require cities, municipals drain a lot from their budgets.

Ms Janet Salem presented the three steps approach of UNESCAP in dealing with Urban plastic pollution:

- Firstly, the UNESCAP will focus on measuring the plastic waste. They seek to answer to questions, such as: what's the source of plastic pollution? Which products are dominating plastic pollution? Where are the leakage points?

The UNESCAP also do baseline assessments on the qualitative information at the context of the city. What are the existing policies relevant to plastic pollution? Who are the stakeholders? What are the capacities and so forth?

- Secondly, the UNESCAP will focus on a monitoring system by developing a digital mapping tool of plastic hotspots with data collected from satellites, sensors, crowd sourced data, processed using machine learning algorithms, stored and visualized on a platform.
- Thirdly, once the UNESCAP have done all those steps, it will become very easy to identify cities' action plans, investment strategies and policy intervention priorities.

The UNESCAP has also developed an e-learning course with 7 modules to cover in details every step of this process.

Ms Janet Salem reiterated the important role of regional cooperation in increasing the efficiency when implementing the three steps approach.

CONCLUSION

Marine debris is a complex cultural and multi-sectorial problem that imposes tremendous ecological and economic costs around the world. More information is needed to understand the status and trends in amounts, distribution and types of marine debris. So that, some international and regional firms such as IUCN, UNESCAP, World Bank are focusing on measuring and monitoring the above data of land-based debris.

At state level, strategies and policy interventions are main factors to consider in reducing plastic pollution from land-based pathways in this period. In the short-term, preventing plastic littering, improving plastic waste collection service, including waste collection coverage and efficiency as well as improving final disposal (stopping open disposal and burning plastic waste) were identified for implementation. Long-term strategies and actions to promote circular economy and sustainable lifestyles would be necessary in order to bring about radical changes from linear to more sustainable plastic production and consumer society.

It is the crucial point highly agreed in the workshop that emphasized the increasingly important role of innovative technologies. Therefore, state strategy need to involve the non-state actors and private sectors who directly research and implement innovative solutions to solve the land-based debris into the ocean.

State policies is indeed important to lead to the integrated goal from long-term, medium and short-term strategic programs, however, they are only successful when they can involve as much as possible the participation of different stakeholders by creating an enabling environment conditions and business opportunities.

**PROMOTING INNOVATIVE MODELS IN REDUCING AND MANAGING LAND-BASED
DEBRIS INTO OCEANS FOR SUSTAINABLE DEVELOPMENT
COMPENDIUM OF RECOMMENDATIONS**

I. Promoting the application of innovative models, especially modern technologies in the prevention, treatment and management of land-based marine debris.

1. Focusing on high-technology based solutions for Land-based Marine Debris prevention and cleaning purposes which constitute only 40% of existing innovative solutions.
2. Creating more funding schemes that enable new startups or cooperation between the scientific community and the private sector to hand over prototype solutions to commercial product providers ¹.
3. Creating incentives for more engagement of the private sector in campaigns such as programs and campaigns on circular economy, product life-cycle management projects, sustainable consumption and production and “3R” approaches.
4. Promoting private sector's investment in redesigning products/packaging and alternative materials.
5. Engaging value chain stakeholders to establish an enabling mechanism infrastructure in order to increase waste recovery and recycling rates.

II. Strengthening the cohesion between the stakeholders (state authorities, activists, businesses), jointly developing and implementing synchronous, substantive and effective plans in solving Land –based Debris’ leakage into oceans

6. Setting ambitious waste management targets at the economy-wide and at municipal levels. Set up target for EPR schemes for particular issues such as packaging, collection target for pre-paid garbage bags, market restrictions on unnecessary and avoidable items at risk of becoming marine litters such as single-use/disposable straws, food containers, cutlery, etc.¹
7. Building waste management performance indicators and methodology to track progress against economy-wide and municipal waste targets, maintain an economy-wide waste database: identification of hotspots, waste profile studies to identify trends and target items, number of certified collectors, sorters, recyclers, etc.,²
8. Increasing funding and improve outcomes by financing all phases of integrated waste management systems, enabling innovative, transparent funding approaches such as investing green taxes and clean tax cuts, extended consumer responsibility schemes as appropriate³.

III. Building networks and partnerships to enhance learning, exchange and update of data, best practices and the latest solutions and strategies applied in APEC in handling to land –based debris into oceans

9. Developing the standardization or harmonization of data collecting approaches, with a view to establish a centralized data sharing system or platforms which will science-based policy decisions

¹Report update of 2009 APEC report on economic costs of marine debris to APEC economies, p.78 (APEC Secretariat - Project OFWG 01 2018A, 2020)

²Report update of 2009 APEC report on economic costs of marine debris to APEC economies, p.79 (APEC Secretariat - Project OFWG 01 2018A, 2020)

³Report update of 2009 APEC report on economic costs of marine debris to APEC economies, p.80 (APEC Secretariat - Project OFWG 01 2018A, 2020)

10. Organizing regional expert exchange platforms and/or study-trip programme⁴.
11. Establishing regional information platform to exchange information and share innovative solution and best practices (such as ASEAN).
12. Developing regional Guidebook for Common Methodologies for Assessment and Monitoring of Marine Litter⁵.

IV. Increasing public awareness of environmental challenges due to ocean debris littering from land and current sustainable development trends

13. Promoting sustainable lifestyles and diets of urban population through ongoing public education initiatives⁶.
14. Promoting the use of digital technologies to facilitate efficient use of transport assets and sustainable consumption. Digital technologies are enablers for the sharing economy and smart cities⁶.
15. Engaging with coastal communities with a view to enhance public awareness about marine debris, and helps to develop new attitudes towards littering⁷.
16. Fostering the availability of reliable information through public education and communication campaigns linked to waste reduction and recycling promotion programs.

V. Strengthening cooperation between international and regional organizations on the development of innovative models in preventing, treating and managing Land-based debris into oceans for sustainable development

17. Enhancing meaningful commitments from governments, local authorities, governors, and mayors to develop holistic and integrated plastic waste management strategies and actions, including ambitious plastic waste reduction, reuse and recycle targets, the installation of effective institutional and financial systems to address plastic waste pollution from land-based sources.
18. Promoting favorable project-finance investment conditions for the private and public sectors by ensuring that ocean-plastic and waste management agendas are carefully prioritized across multilateral institutions and regional bodies (e.g. ASEAN, APEC, UN), aid organizations and development banks (e.g. ADB, World Bank, GEF), governments, convening institutions, major corporate players in the chemicals, plastics, and consumer-goods industries⁸.
19. Closing the gap in coordinating multi-stakeholder partnerships at the regional level by exploring ways to match waste management service providers and financing institutions or individual investors, following by creating opportunities for the return of investments to make plastic management projects bankable⁶.
20. Organizing regular policy dialogues on combating marine debris with a view to develop a regional action plan on tackling this issue in the Asia – Pacific region.
21. Further discussions for better engaging private sectors on dealing marine debris issue should be promoted to solving barriers in different contexts in Asia – Pacific economies.

⁴ ASEAN Framework of Action on Marine Debris

⁵ ASEAN Regional Action Plan for COMBATING MARINE DEBRIS in the ASEAN Member States (2021-2025) [FINAL_210524-ASEAN-Regional-Action-Plan_Ready-to-Publish_v2.pdf](#)

⁶ Regional: Supporting Implementation of Environment Related Sustainable Development Goals in Asia and the Pacific (ADB, 2020)

⁷ Secretariat of the Convention on Biological Diversity and the Scientific and Technical Advisory Panel—GEF (2012). Impacts of Marine Debris on Biodiversity: Current Status and Potential Solutions, Montreal, Technical Series No. 67, 61 pages

⁸ Stemming the Tide: Land-based strategies for a plastic-free ocean (Ocean Conservancy, 2015)

