



**Asia-Pacific  
Economic Cooperation**

**Project Report:  
APEC Sustainable Coastal Cities  
Symposium 2021**

**APEC Ocean and Fisheries Working Group**

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Council

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Think Tank & Policy, Penang Green Council

Josephine Tan  
General Manager's Office, Penang Green Council

# Symposium Speakers and Moderators

## Opening Ceremony

YB Dato' Sri Dr Adham Bin Baba  
Ministry of Science, Technology and Innovation  
(MOSTI), Malaysia

Professor Datuk Ir. Ts. Dr Siti Hamisah Binti Tapsir  
UCSI University, Malaysia

Associate Professor Dr Eric Chan Wei Chiang  
UCSI University, Malaysia

## Issues and Challenges on Marine Debris faced by APEC Cities

Professor Dato' Dr Ahmad Bin Ibrahim, FASc  
UCSI University, Malaysia

Nur 'Aishah Binti Md Norodin  
Penang State Secretariat, Malaysia

Cheryl Rita Kaur  
Maritime Institute of Malaysia (MIMA)

## Best Practices in Addressing Marine Debris

Dr Mohammed Rizman Iddid  
Universiti Malaya, Malaysia

Dr Nguyen Thu Trang  
World Wildlife Fund (WWF), Viet Nam

Lena Kampe  
Deutsche Gesellschaft für Internationale  
Zusammenarbeit (GIZ) GmbH, Germany

Hery Gunawan Daulay  
Ministry of Marine Affairs and Fisheries, Indonesia

## The Role of Non-Governmental and Community Engagement in addressing Marine Debris

Shantini Rajan  
World Wildlife Fund (WWF), Malaysia

Professor Dr Shigeyuki Baba  
International Society for Mangrove Ecosystems  
(ISME), Japan

Dr Abdhesh Kumar Gangwar  
Regional Centre of Expertise (RCE) Srinagar, India

Hao Xin  
Green Zhejiang, China

Dr Lin Yola  
Universitas Indonesia, Indonesia

## The Role of Public-Private Partnership in addressing Marine Debris

Jacqueline Chang  
Circular Economy Institute, Malaysia

Cheng Hsiu Tsai (Damon)  
Plastics Industry Development Center (PIDC),  
Chinese Taipei

Seah Kian Hoe  
Heng Hiap Industries (HHI), Malaysia

Saltanat M Kazi  
The Energy and Resources Institute, India

Professor Dr Richard Bellerby  
SKLEC-NIVA Centre for Marine and Coastal  
Research, China

Dr Raslan Ahmad  
Malaysia Industry-Government Group for Higher  
Technology (MIGHT), Malaysia

## Technology and Innovation for Sustainable Coastal Cities

Professor Ts. Dr Mohd Hafiz Dzarfan Othman  
Universiti Teknologi Malaysia

Professor Dr Mohd Razman bin Salim  
UCSI University, Malaysia

Dr Chia-Ying Jessie Ko  
National Taiwan University, Chinese Taipei

Dr Chao Fang  
Ministry of Natural Resources, China

Associate Professor Dr Goh Pei Sean  
Universiti Teknologi Malaysia

Dr Kuit Sui Hyang (Vivian)  
Blue Communities, Malaysia

Dr Rinny Rahmania  
Ministry of Marine Affairs and Fisheries (MMAF),  
Indonesia

Professor Dr Thammarat Koottatep  
Asian Institute of Technology (AIT), Thailand

Associate Professor Dr Matthew Tan  
Asia of Assentoft Aqua Asia Pte Ltd., Singapore

## Closing Ceremony

Professor Datuk Dr Asma binti Ismail  
Akademi Sains Malaysia (ASM)

# Symposium Activities

## Introduction

The APEC Sustainable Coastal Cities Symposium was conducted virtually from 24 to 26 November 2021. Addressing the crucial topic of sustainability in coastal cities, the symposium was organised by an inter-faculty taskforce led by Associate Professor Dr Eric Chan Wei Chiang, Associate Professor Ts Dr Ang Chun Kit, Assistant Professor Dr Michelle Soo Oi Yoon, Assistant Professor Dr Eugenie Tan Sin Sing and Assistant Professor Dr Chew Yik Ling.

Coastal cities are among the most populated areas in the world with over half of the global population living in coastal zones. Significantly, with the geographic coverage of the Asia-Pacific Economic Cooperation (APEC) extending to many coastal cities contributing to trade, transport and transboundary cooperation between member economies, the symposium was attended by participants from both the public and private sectors, covering a range of industries. Over 200 participants from 12 APEC Economies and two non-member Economies registered for the event, representing various government agencies, non-governmental agencies, private companies and universities.

The project is supported and financed by APEC via its Marine Debris Management and Innovation sub-fund. The theme for the symposium this year is 'Marine Debris' but it is hoped that this would be expanded in the coming years to cover other relevant topics relating to sustainability.

The symposium was officiated by Yang Berhormat Dato' Sri Dr Adham Baba, Minister of Science, Technology and Innovation, Malaysia. In his speech, the minister emphasised the need to keep global warming below 1.5 degree Celsius this century by halving greenhouse gas emissions in the next eight years, in line with the Paris Agreement adopted during the United Nations Paris Climate Accords in 2015.

Acknowledging the problems of marine litter generated by consumer consumption, Yang Berhormat Dato' Sri Dr Adham Baba highlighted the 26th United Nations Climate Change Conference which brought into focus the struggles of coastal cities around the world. The issue of coastal erosion and rising sea-levels and critically, the increased prevalence of marine debris was among the concerns raised by the conference. According to data from the United Nations Environmental Programme 2021, at least 8 million tonnes of discarded plastic are dumped into our oceans each year and this figure is projected to double by 2030 and may even triple by 2040 if things are left unchecked.

This was affirmed by Professor Datuk Ir. Ts. Dr Siti Hamisah Binti Tapsir, UCSI Group Chief Executive Officer, Vice-Chancellor UCSI University, who, in her welcome speech, highlighted the University's ironclad commitment towards sustainability, promoting transformative societal, scientific, economic and behavioral outcomes. This commitment is supported by a strong research culture, with UCSI having more than tripled its World of Science and Scopus publications from 2015 to 2020. Additionally, the University is home to eight Fellows of Academy of Sciences Malaysia.

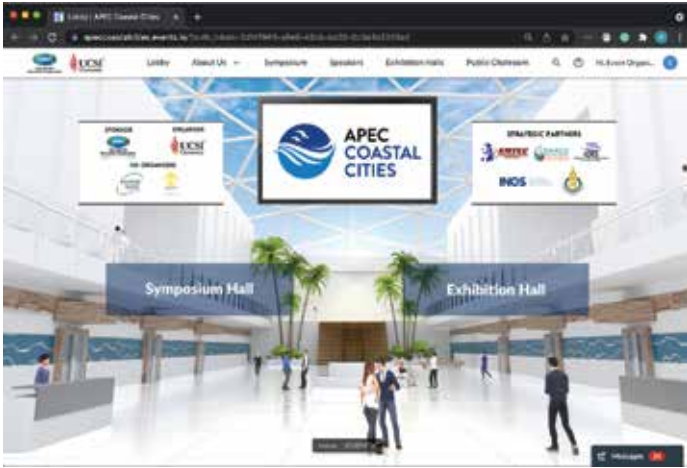
Among the symposium attendees were Professor Datuk Dr Asma Ismail, President of Academy of Sciences Malaysia and Professor Dr Athor Subroto, Director of School of Strategic and Global Studies, Universitas Indonesia, who represented the symposium co-organisers.

The three-day symposium hosted a line of distinguished speakers from seven APEC member Economies and one non-member Economy, covering a range of topics from government policy, involvement of non-governmental and private sectors and technologies relating to sustainability.

On the final day of the symposium, the APEC Sustainable Coastal Cities Research Consortium pledged to continue upholding the sustainability agenda, facilitating further discourse as a platform for disseminating information and generating new knowledge, relevant to the protection and development of sustainable coastal cities.

Finally, the closing address delivered by Professor Datuk Dr Asma Ismail, acknowledged UCSI's contribution in promoting and facilitating the sustainability agenda through the launch of its Research Consortium.

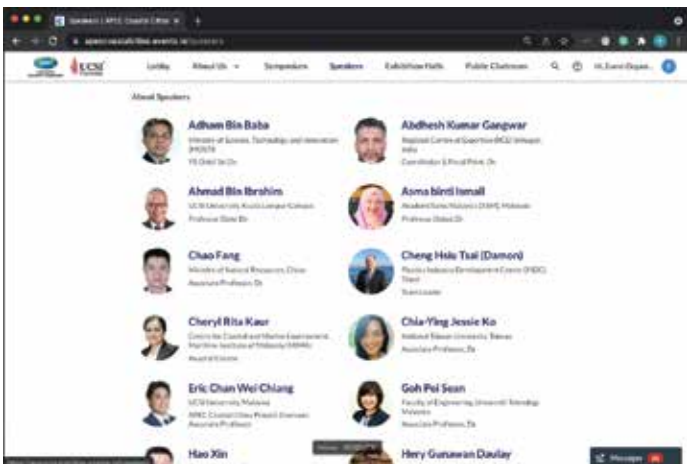
Findings from the Symposium are compiled in an APEC publication entitled, 'Best practices and recommended policies for optimising the plastic supply chain in Southeast and East Asia'.



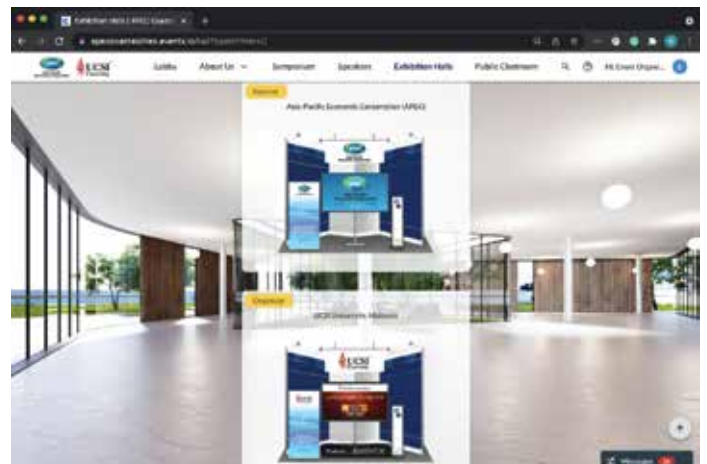
Symposium lobby featuring APEC, UCSI, co-organisers and strategic partners



Yang Berhormat Dato' Sri Dr Adham Baba Minister of Science, Technology and Innovation Malaysia officiating the symposium



Speakers from different APEC member and non-member economies



Exhibition hall of the symposium featuring 12 exhibitors



## Pre-symposium Focus Groups

Several pre-symposium focus groups were held between 3 to 17 September 2021 to gather information from stakeholders for the APEC publication. With an all-star roster of senior researchers from the Academy of Sciences Malaysia (ASM) chairing the sessions, the pre-symposium focus groups proved to be a very interactive sharing platform. Session chairs included:

- Prof. Dr Wan Izatul Asma binti Wan Talaat (Institute of Oceanography & Environment (INOS), Universiti Malaysia Terengganu)
- Dato' Dr Aileen Tan Shau Hwai (Centre for Marine & Coastal Studies (CEMACS), Universiti Sains Malaysia)
- Prof. Datuk Dr Ahmad Fauzi Ismail (Advanced Membrane Technology Research Centre (AMTEC), Universiti Teknologi Malaysia)

Extensive information from APEC Economies on the challenges relating to marine debris and a wide range of creative local solutions to the problem were gathered.

One of the most pertinent issues is to acknowledge regional differences and develop local solutions. Indonesia, for instance, has an enormous challenge in providing sufficient waste management infrastructure across their thousands of inhabited islands. Japan faces similar challenges but has a better developed infrastructure, while Viet Nam is aggressively closing the technological gap in solid waste management technologies.

Information sharing between APEC Economies provides opportunities for mutual learning which potentially produces creative solutions. One solution proposed during the focus group was the idea of ship-borne incinerator vessels which could themselves be a technological challenge. Efforts made to reduce marine debris are also made alongside efforts to secure coastal cities against sea-level rise. Indeed, platforms to share experiences, technologies and practices are very much needed. The symposium hopes to not only formalise the suggestions and outcomes but also to spearhead research and collaboration across the different APEC Economies to collectively mitigate marine debris and promote sustainable coastal cities.



Presentation by Professor Dr Wan Izatul Asma Wan Talaat, FASc on Governmental policies for addressing Marine Debris in a session on 3 September 2021.



Presentation by Professor Dato' Dr Aileen Tan Shau Hwai, FASc on Non-Governmental Initiatives and Practices for addressing Marine Debris in a session on 10 September 2021.



Presentation by Professor Datuk Dr Ahmad Fauzi Ismail FASc on Innovation and Technologies for addressing Marine Debris in a session on 17 September 2021.



Focus group chairpersons, invited presenters and participants from various APEC member and non-member Economies including China, Viet Nam, Indonesia, Thailand, India, Chinese Taipei and Malaysia.

## Focus Group Participants

Senior Professor Dr Phang Siew Moi, FASc (UCSI University)	Dr Ng Fong Lee (Universiti Malaya)
Professor Dr Che Abd Rahim Mohamed (Universiti Kebangsaan Malaysia)	Dr Nur Haliza Hassan (UCSI University)
Professor Dr Lim Phaik Eem (Universiti Malaya)	Dr Tran Thi Ngoc Diep (RCE Southern Vietnam)
Professor Dr Mohd Razman Bin Salim (UCSI University)	Amira Aqilah Shaidin (Akademi Sains Malaysia)
Professor Dr Sumiani Binti Yusoff (Universiti Malaya)	Daniel Loo (Malaysian Recycling Alliance)
Professor Dr Yeong Siew Wei (UCSI University)	Faisal Abdur Rani (Impact Revolution Enterprise)
Professor Dr Thamarat Koottatep (Asian Institute of Technology)	Hoang Nhat Truong (RCE Southern Vietnam)
Professor Ir Dr Suzana Yusup (Universiti Teknologi PETRONAS)	Jacqueline Chang (Circular Economy Institute)
Associate Professor Dr Chia-Ying Ko (National Taiwan University)	Lee Kwai Han (generaSEEd)
Associate Professor Dr Juhana Jaafar (Universiti Teknologi Malaysia)	Min Zhang (Third Institute of Oceanography)
Associate Professor Dr Jun Bo (Third Institute of Oceanography)	Mukvinder Sandhu (UCSI University)
Associate Professor Dr Norhaniza binti Yusof (Universiti Teknologi Malaysia)	Naventhan a/I Ahrasan (Penang Green Council)
Associate Professor Dr Yim Hip Seng (UCSI University)	Nor Aslinda Awang (National Hydraulic Research Institute Malaysia)
Assistant Professor Dr Michelle Soo Oi Yoon (UCSI University)	Pauline Goh (Malaysian Recycling Alliance)
Dato' Paduka Ir Dr Keizrul Abdullah (Wetlands International Malaysia)	Rinny Rahmania (Ministry of Marine Affairs and Fisheries, Indonesia)
Ts Dr Chung Ying Tao (UCSI University)	Shamili Nair A/P Ravindran Nair (Universiti Malaya)
Ts Dr Ng Jing Lin (UCSI University)	Tan Thung (Penang Green Council)
Dr Chung Ying Tao (UCSI University)	Wong Fen Fen (Penang Green Council)
Dr Hasrinah Hasbullah (Universiti Teknologi Malaysia)	
Dr Jian-Wu Lai (National Academy of Marine Research, Chinese Taipei)	
Dr Lai Li Sze (UCSI University)	
Dr Lin Yola (Universitas Indonesia)	
Dr Mazlan Madon (University of Oxford)	

## Opening Ceremony Greetings from the Project Overseer



Associate Professor Dr Eric Chan Wei Chiang  
UCSI University, Malaysia

Yang Berhormat Dato' Sri Dr Adham Baba,

Minister of Science, Technology and Innovation, Malaysia

Professor Datuk Ir. Ts. Dr Siti Hamisah Binti Tapsir, UCSI Group Chief Executive Officer,  
Vice-Chancellor UCSI University

Pro-Vice-Chancellors of UCSI University, Kuala Lumpur Campus, Springhill Campus & Kuching  
Campus.

Delegates from APEC member Economies, vice-chancellors and senior academicians, distinguished  
guests, ladies and gentlemen,

The majority of the world's most populated cities housing over half of the global population are in the coastal zone. The geographic coverage of APEC extends to many coastal cities contributing to trade, transport and transboundary cooperation between member Economies. In addition to climate change which impacts energy consumption and food production, marine debris is a major hurdle against ensuring sustainability in coastal cities.

As project overseer for this APEC Symposium, I am very pleased to report that over 200 participants have registered for this event from 12 APEC Economies and two non-member Economies. Participants include various stakeholders such as government agencies, non-governmental agencies, private companies and universities. This would be a great starting point for a dialogue on the sustainability of coastal cities and how the problem of marine debris can be addressed by transboundary cooperation incorporating new policies, practices and technology.

I would like to express my gratitude to APEC's Marine Debris Management and Innovation sub-fund for funding this project and to the co-organisers, the Academy of Sciences Malaysia and the School of Strategic and Global Studies, Universitas Indonesia.

As part of this symposium, UCSI University would be inaugurating the APEC Sustainable Coastal Cities Research Consortium that would continue this agenda into the future as a platform for disseminating information and generating new knowledge that are relevant towards sustainable coastal cities.

I welcome all of you here today and I look forward to an engaging discussion and sharing good practices and knowledge with your respective Economies.

## Welcome Address by Vice-Chancellor of UCSI University



Professor Datuk Ir. Ts. Dr Siti Hamisah Binti Tapsir  
UCSI University, Malaysia

Yang Berhormat Dato' Sri Dr Adham Baba,

Minister of Science, Technology and Innovation, Malaysia

Pro-Vice-Chancellors of UCSI University, Kuala Lumpur Campus, Springhill Campus & Kuching Campus.

Delegates from APEC member nations, vice-chancellors and senior academicians, distinguished guests, ladies and gentlemen,

Good morning and welcome to the APEC Sustainable Coastal Cities Symposium.

It gives me great pleasure to welcome all of you today. I would like to record my thanks to YB Dato' Sri Dr Adham Baba for officiating this three-day event. We appreciate the hard work the ministry is doing in regards to pollution control and we are honoured by his presence.

This symposium is most timely. The sustainability of coastal cities is a shared responsibility and I am encouraged that we are coming together to address an existential crisis. Nearly every day, we receive news on global warming, coastal erosion and rising sea-levels. Atoll nations may be submerged by 2050 and around 70% of Asia would be vulnerable to inundation.

Coastal megacities like Shanghai, Hong Kong, Mumbai, Jakarta and Bangkok would be hard hit and swathes of agricultural land - the lifeblood of many B40 communities - would also face devastation.

Ladies and gentlemen,

The fragility of our coastal cities frames the context of this symposium. Inconvenient truths like marine debris can no longer be ignored and all of us - governments, NGOs, thought leaders, activists and business leaders - must focus on consequential change. And with this symposium, we have a working framework to align our ideas, overcome structural impediments and commit to shared initiatives with far-reaching impact.

I would like to thank the APEC Marine Debris Management and Innovation sub-fund for their support and sponsorship. Thank you for making this possible. UCSI University is honoured to host today's event.

Our Regional Centres of Expertise in Kuching and Kuala Lumpur champion a range of social and economic development initiatives in support of the UN's SDGs and this symposium dovetails nicely with RCE Kuching's efforts. The commitment to social change has seen UCSI University's global profile improving considerably over the past decade. The 2022 QS World University Rankings ranks UCSI University in the world's top 1.1% and we also stand out as a top 80 university in Asia. Much of this progress has been driven by research and capacity development.

UCSI has more than tripled its World of Science and Scopus publications from 2015 to 2020 and the University is home to eight Fellows of Academy of Sciences Malaysia. While these milestones are encouraging, we are ever-cognisant that the true success of a university is measured by its impact on society.

UCSI University has made an ironclad commitment to achieve societal, scientific, economic and behavioral change. If you share the same passion, we would like to extend the hand of partnership to you and your esteemed organisation. The adage goes: "If you want to walk fast, walk alone. But if you want to walk far, walk together". Let us focus on going further during - and after - this symposium. May we have a fruitful meeting of minds. And may we come up with new insights that will turn the tides in favour of our coastal cities.

Thank you.

## Opening Speech by Minister of Science, Technology and Innovation, Malaysia



YB Dato' Sri Dr Adham Bin Baba  
Ministry of Science, Technology and Innovation (MOSTI), Malaysia

Assalamualaikum W.B.T and Salam Keluarga Malaysia,

Yang Berbahagia Professor Datuk Dr Siti Hamisah Tapsir  
UCSI Group CEO and Vice-Chancellor

Pro-vice Chancellors of UCSI University from the KL, Springhill and Kuching Campus,

Delegates from APEC member nations;

Senior Academicians and

Distinguished guests.

It is an honour for me to address all of you virtually at the Asia Pacific Economic Cooperation Sustainable Coastal Cities Symposium 2021. To all international and Malaysian delegates, I wish you welcome and Selamat Datang!

Ladies and gentlemen,

The Emissions Gap Report 2021 shows that new national climate pledges combined with other mitigation measures put the world on track for a global temperature rise of 2.7 degrees Celsius by the end of the century. That is well above the goals of the Paris Climate Agreement and would lead to catastrophic changes in the earth's climate. To keep global warming below 1.5 degrees Celsius this century which is the aspirational goal of the Paris Agreement, the world needs to halve its annual greenhouse gas emissions in the next eight years.

Accordingly, this symposium is organised with one simple mission in mind - what policies can be drafted to safeguard coastal cities for future generations to come?

Members of the floor,

As we all know, APEC serves as a platform to bring stakeholders from all twenty-one APEC member economies to discuss technologies and policies that are necessary for the sustainability of coastal cities into the next century.

All of you might wonder, what exactly is the importance of coastal cities to us? Now, coastal cities have impacted human civilisation from the beginning of humanity. In the 15th century, Malacca for example, was a coastal city which served as one of the biggest entrepot that brought international trade and migration to the region.

Now, if we take a moment to ponder upon human civilisation, we see that there has always been the precedent for human population to move towards coastal cities. Do you know that 14 of the world's seventeen largest cities are located along coastal lines? Interestingly, 11 out of this 14, including Shanghai, Bangkok and Jakarta are located in Asia!

Which is why, it is very important for us throughout this three-day symposium, to make a change for the future!

Ladies and gentlemen,

With the urbanisation of coastal cities, human civilisation gets to appreciate better infrastructure, housing, education, healthcare, tourism and even higher living standards.

However, with increased human population in coastal cities, there is the problem of excessive consumption and waste mismanagement. These problems include poor garbage disposal systems which increase the issue of marine dumping and litter.

This specific problem was also recently addressed during the 26th United Nations Climate Change Conference which highlighted the struggles of coastal cities with problems of coastal erosion and rising sea-levels.

According to data from the United Nations Environmental Programme 2021, at least 8 million tonnes of discarded plastic are dumped into our oceans each year and this figure is projected to double by 2030 and may even triple by 2040 if things are left unchecked.

Members of the floor,

Let us not forget that oceans are our largest natural carbon sink for greenhouse gasses. If our oceans get clogged with marine debris like plastic, it takes hundreds of years for this debris to break down. As a result, this natural carbon sink loses its effectiveness and further increases the alarming cycle of global warming.

Now, my purpose here is not only to state the obvious and the problems. We are all here today to make a change. Now what can Malaysia do and what can we achieve?

I want all of you to ask yourselves these questions. Can we dramatically reduce the use of single-use plastic? Are we going to commit to innovative waste management systems that promote circular economy? Are we going to work together to clean up our oceans? And if we are, how should we go about it?

Ladies and gentlemen,

The 12th Malaysia Plan, recently announced by the Prime Minister, YAB Dato' Sri Ismail Sabri Yaakob, has highlighted the shared prosperity initiative by the Malaysian government for the five-year plan from 2021 to 2025 with three aspects: economic empowerment, environmental sustainability and social re-engineering.

In line with Malaysia's aspiration towards sustainability, MOSTI directly encourages industry players to transition towards bioproducts from renewable resources to decrease carbon footprint and emissions.

MOSTI also believes that discussions between all experts throughout this symposium will shed some light on the issues and challenges related to the single usage of plastic which directly harms coastal cities in Asia and across the globe.

MOSTI is confident that the sharing of ideas among delegates here could lead to new knowledge, new R&D and technology to be implemented not only in Malaysia, but also in the Asia Pacific region.

Members of the floor,

MOSTI is motivated to increase focus on technological innovation which specifically addresses marine debris especially along coastal cities.

In line with this aspiration, MOSTI has positioned biotechnology as a new economic engine for Malaysia and aims to build a conducive environment for R&D and industry development to effectively reduce the usage of plastics.

MOSTI is confident that by bringing together government agencies, NGOs, policy makers, thought leaders, academia and activists, we are all here to establish a framework for collective action. My heartfelt thanks to all the delegates for taking your time in attending this symposium.

Ladies and gentlemen,

Before I end my speech here today, let us commit to this meeting of minds and use the opportunity to come up with the proposals that will make coastal cities more sustainable. Let us explore every avenue, leaving no stone unturned. Remember, be part of the solution and not part of the pollution!

With Bismillahirrahmanirrahim, I officiate the Asia Pacific Economic Cooperation Sustainable Coastal Cities Symposium 2021.

Thank you.



## Issues and Challenges on Marine Debris Faced by APEC Cities

### Summary of Session

Every year, 8 million tonnes of plastic enter the ocean. It is estimated 1.15 – 2.41 million tonnes of plastic flow/leakage from global riverine system into the ocean per year. Ocean and beaches in the region are threatened by mismanaged solid waste including plastic waste. Marine debris come from land-based sources that include personal care products (microbeads), textiles (synthetic fibre) and retail (packaging). However, sea-based sources from aquaculture and fishing are also significant contributors.

Policies addressing marine debris must therefore also address leakage of plastics from both land and sea-based sources, the reduction of plastics in circulation, recycling and the recovery of plastics from the oceans. This is recognized by regional coordinating bodies in their action plans such as the ASEAN Regional Action Plan and the SIWI Source-to-Sea Framework for Marine Litter Prevention.

Locally in Malaysia there are initiatives such as Penang2030 (Penang State) and the newly launched National Marine Litter Policy.



**Moderator**

Professor Dato' Dr Ahmad Bin Ibrahim, FASc  
UCSI University, Malaysia

### Profile

Graduated in Chemical engineering from Monash University, Melbourne, obtained PhD in Wastewater Engineering, Newcastle University UK, did Post-doctorate at Cornell University, USA under Hubert Humphrey Fulbright program, attended Advanced Management Program at Oxford University Business school.

Now serve as Professor of Chemical Engineering at UCSI University, also Senior Advisor Malaysia for Fraunhofer Research Network Germany....

A Fellow of the Academy of Sciences Malaysia, ASM, a Fellow of the ASEAN Academy of Engineering & Technology, AAET, and Fellow of the International Rubber Research and Development Board, IRRDB.

Now, active interest in Policy for Sustainable Cities, UN-SDGs, Climate Change issues, Low Carbon Management, STI Policy studies on energy, water and agriculture.

Writes extensively in the media on issues related to STI, Sustainability, Smart Urban Planning, City Wastes, Future of the rubber industry, future-proofing the palm oil business.



Nur 'Aishah Binti Md Norodin  
Penang State Secretariat, Malaysia

### Abstract

Dealing with marine debris has become a transboundary environmental problem which requires collective efforts. According to the United Nation Environment Programme (UNEP), an estimated 80 per cent of all marine pollution is caused by human activities on land where plastic items consistently represent the major categories of marine debris by material type on a global basis.

Reducing marine litter from land-based sources requires successfully addressing solid waste leakage from human activities on land. Waste is released by littering on land and beaches, illegal dumping and through tourism and recreational activities on beaches, to name a few.

The diversity in Penang is not only limited to its culture but extends to its beaches as well, drawing a steady crowd of tourists and locals. Tourism is an important socio-economic activity for the state of Penang but if poorly managed, it will lead to increase in litter pollution on beaches during the tourism seasons.

Penang has recently come out with Penang 2030: A family-focused Green and Smart State that Inspires the Nation. Green signifies the government's awareness that there is really no alternative to a balanced development. A well-kept balance between economic growth and ecological protection can help make Penang the model state we all want it to remain. Under Theme A: Increase liveability to enhance the quality of life and Strategic Initiative A2: Continue to improve public safety and cleanliness – general hygiene and cleanliness of streets, shops, rivers and coastal waterways are necessary to raise the level of liveability.

The Penang State Government has focused on taking preventive solutions by preventing litter from entering the marine environment by ensuring that policies are in place. These include the Waste Segregation at Source Policy and No Free Plastic Bag as well as promoting 3R (Reduce, Reuse, Recycle) programmes. Penang has always strived to realise the vision of making Penang a 'Cleaner, Greener, Safer and Healthier' state.

Marine debris are a major threat to marine and coastal biodiversity. Therefore, there is an urgent need to address marine debris to prevent and mitigate its adverse impacts on the environment.

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### Profile

Sixteen years' experience in advising and supporting the government in delivering policies and public services with four years' experience working for Local Government (urban planning, heritage preservation, public health, sanitation, waste management, traffic management, environmental protection, building control, social and economic development, and general maintenance of urban infrastructure).

Skilled in drafting new policies as well as coordinating the monitoring and implementation of policies.



Cheryl Rita Kaur  
Maritime Institute of Malaysia (MIMA)

### Abstract

The United Nations Environment Programme (UNEP) defines marine litter as 'any persistent, manufactured or processed solid material discarded of or abandoned in the marine and coastal environment'. Marine litter (largely consisting of plastic pollutants) has been recognised as a serious global environmental problem. Accordingly, research efforts addressing the issue have constantly grown since.

The increasing use of single-use products, uncontrolled disposal of litter, along with poor waste management and recycling practices are among the reasons for the accumulation of litter in the sea. Reports show that increasing quantities of litter are lost from municipal waste streams into the oceans, and subsequently documented in many marine species. The issue is a great concern for Malaysia, being ranked eighth in the world for the worst managed plastic waste in the study conducted by Jambeck et al. in 2015; underlining the fact that the nation mismanaged about 0.94 million tonnes of plastic waste in 2010, of which 0.14-0.37 million tonnes could have ended in the ocean.

Given the proliferation of plastics into all aspects of human activities, the phenomena associated with plastic pollution of the marine environment will continue to merit scientific/technical investigation and seek policy formulation and actions. The current situation, especially in the developing world, is however hampered by the lack of national baseline information. Current estimates are largely based on limited sampling and modelling, which will indefinitely require further attention. As a way forward to addressing needs and gaps, in line with international and regional progress on addressing marine litter pollution, Malaysia has since developed a national policy and action plan with the involvement of all stakeholders. This presentation will therefore discuss these issues and challenges faced by Malaysia, as well as highlight actions undertaken to address them.

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### Profile

Dr Cheryl Rita Kaur completed her MSc in Marine Science, Policy and Law from the University of Southampton UK, BSc (Hons.) in Marine Biology from University Malaysia Terengganu (UMT), and a Diploma in Multilateral Environmental Agreements from the University of Eastern Finland.

She is currently Head of the Centre for Straits of Malacca (CSOM) at the Maritime Institute of Malaysia (MIMA), as well as an Associate Fellow at the Institute of Oceanography and Environment (INOS) of Universiti Malaysia Terengganu (UMT).

Cheryl's research interest is in the areas of ocean governance, natural resources, marine protected areas management, and marine pollution. She is currently focusing on assisting with the development of a draft national policy framework to address marine litter under the national focal ministry. She was earlier instrumental in establishing the Clean Coast Index (CCI) as a suitable tool for a structured and systematic baseline data collection in pilot sites around the Malaysian coastline. Amongst others, her focus and research interests have been on addressing policy and management gaps and needs relating to marine litter at the national and local levels. She has produced several papers and information relating to the subject area, including two comprehensive research papers with a focus on gaps in existing marine litter monitoring and baseline, policy and management challenges and recommendations on marine litter. More recently, she was involved in discussions at the COBSEA level and is continuing her assessment on the subject area to provide feasible recommendations to the stakeholders involved at the different levels.

## Best Practices in Addressing Marine Debris

### Summary of Session

There are many transnational initiatives addressing marine debris in the APEC region including Rethinking Plastics (ECESP) and Plastic Smart Cities (WWF). The Rethinking Plastics project supports the transition towards circular economy for plastics in East- and Southeast Asia to reduce plastic waste leakage into the ocean and thus marine litter. The Plastic Smart Cities initiative described a three-pronged approach in their action plan, namely, reduce the amount of plastic in the system, increase the circulation of the plastic already in the system and eliminate the leakage of plastic out of the system.

Initiatives by APEC member economies include Gerakan Cinta Laut (Ocean Care Movement, Indonesia). The movement engages school to promote behavioural change, improves waste collection infrastructure and engages in R&D to reduce marine debris.



**Moderator**

Dr Mohammed Rizman Iddid  
Universiti Malaya, Malaysia

### Profile

Dr. Mohammed Rizman Iddid has a B.Sc (Hons.) in Zoology (1994) from the University of Malaya. He pursued his studies further and obtained his Ph.D (2006) in Evolutionary Biology from the University of Hull, United Kingdom. He became a lecturer and joined the academic staff at the Institute of Biological Sciences, University of Malaya in 2007. He later joined as a senior lecturer at the Institute of Ocean and Earth Sciences (IOES), University of Malaya in 2014. He was the Head of Marine Biodiversity and Ecosystems Studies Research Unit in IOES until 2018. He was also the President of Malaysian Society of Marine Sciences from 2012 until 2014.

His research projects mainly focus in providing baseline information on diversity and ecology of terrestrial and marine organisms. Most studies employ the molecular genetic techniques such as DNA sequencing for DNA barcoding of resources in natural ecosystems, and the application of phylogenetics to answer evolutionary questions. He is also considered the authority of jellyfish biodiversity and ecology in Malaysia. He has led several national and internationally organized expedition for biodiversity surveys in marine parks and marine protected areas of Malaysia. He is an active member of Malaysia's National Antarctic Research Programme, researching on the response and adaptation of climate change on tropical marine fungi and polar fungi. He has a H-index of 6, having published over 30 scientific papers and co-authored 2 books. Recently co-authored a report on Ocean Accounts and published a review paper on Marine debris in Malaysia in Marine Pollution Bulletin.



Dr Nguyen Thu Trang  
World Wildlife Fund (WWF), Viet Nam

### Abstract

Plastic pollution has grabbed the world's attention and with its dramatically rapid growth, has become one of the biggest environmental challenges of our decade. Currently, plastic has been found in the least expected places, including in the food we eat, the water we drink and the environment in which we live in.

As a fast-growing economy, Viet Nam, now more than ever, is witnessing dangerous levels of environmental problems resulting from intensive economic development, with plastic waste being one of the serious issues. Viet Nam ranked the fourth in the world for disproportionately contributing to the problem of marine plastics. The convenience associated with plastic usage and its low price are the main factors creating to consumers' heavy dependence on plastic. However, plastic waste management and recycling in Viet Nam and in the world have not been as effective as expected.

As a leading conservation organisation globally, the WWF takes the marine plastic issue seriously. The urgency in tackling ocean plastics issues has become a concern for the WWF. To address the root cause of the problem, we want to work at the local level with provinces, cities and districts, involving the public and private sector to build pioneer models in plastic reduction. This strategy is the key to WWF's Plastic Smart Cities (PSC) programme, which has been implemented in different cities in Viet Nam since 2018, including Thanh Khe district (Da Nang city), Rach Gia and Phu Quoc cities (Kien Giang province), Tuy Hoa city (Phu Yen province), Dong Hoi city (Quang Binh province), Ha Tinh city (Ha Tinh province), A Luoi district and Hue city (Thua Thien Hue province), Con Dao district (Ba Ria – Vung Tau province) and Tan An city (Long An province).

The programme comprises the following objectives, focusing on

- i. studying the overview of marine plastic litter in Viet Nam
- ii. assisting to engage industries in relation to plastic consumption and disposal
- iii. involving the cities in signing up the PSC commitment to the WWF Plastic pollution free Cities Programme and developing an action plan focusing on plastic waste and marine debris management (AP).

These will contribute to the final target of reducing 30% plastic waste leakage into the environment and to the 'no more plastic waste in nature' target by 2030.

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### Profile

With more than ten years of professional experience, Dr Nguyen Thu Trang has a strong track record of ensuring projects and activities are delivered to the highest quality. Her involvement in and with both international and local NGOs in various countries has fostered her ability to build strong working relationships within a multicultural working environment. She is eager to dedicate her strong coordination and communication skills to the advancement of sustainable environment, climate justice, human rights, social equity and the promotion of solidarity.



Lena Kampe  
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Germany

### Abstract

Marine litter is a growing global challenge, affecting more and more marine ecosystems and fisheries as well as the tourism sector. Plastics, for example, in packaging and single-use products such as straws and plastic bags, contribute to a huge amount of waste in the sea. The amount of plastics is rapidly increasing worldwide, driven by rapid urbanisation, economic development and changing consumption and production patterns. At the same time, waste management systems still lack effectiveness in terms of environmentally sound collection, sorting, recycling and disposal of packaging waste.

A transition towards a circular economy for plastics can reduce plastic waste leakage into the sea. In a circular economy, resources are used and managed in a more efficient and sustainable way through the principles of reduce, reuse and recycle. Products, for example, are designed to last longer and to be easier to repair, remanufactured or upgraded as well as to be recycled and reused. With this, materials and resources are returned back to the economy and used again for as long as possible. This is contrary to the so-called linear or throwaway economy in which the usage of products is limited and waste is generated quickly. Thanks to this rethinking, the transition to a circular economy promotes green growth, resource efficiency and biodiversity. It can protect the environment and tackle climate challenges.

To achieve the transition, joint efforts from all stakeholders along the plastic value chain are needed. Initiatives include the entire life cycle of products from focusing on how products are designed, circular economy processes are set up, sustainable consumption is encouraged and waste is prevented or better managed, for example, through introducing approaches such as Extended Producer Responsibility (EPR).

The EU-German Government-funded 'Rethinking Plastics – Circular Economy Solutions to Marine Litter' project works jointly with its partners towards a circular economy for plastics in seven economies in East and Southeast Asia and enhances policy and practical exchanges between the EU, China, Indonesia, Japan, the Philippines, Singapore, Thailand and Viet Nam. It provides advice, promotes exchange and best practice sharing, implements activities and supports more than 20 pilot projects in China, Indonesia, the Philippines, Thailand and Viet Nam to test and disseminate new approaches or upscale best practices to reduce land and sea-based plastic litter. This talk will present the initiatives, pilot projects, their good practices and learnings so far.

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### Profile

Lena Kampe is key expert at the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and works for the EU/German Government funded project 'Rethinking Plastics – Circular Economy Solutions to Marine Litter.'

Lena is currently based in Bangkok and has a background in political science and sustainability as well as communications and awareness raising. After graduating from the University of Mannheim (Germany) in political science and media and communication science, Lena worked as a consultant for a strategy consultancy, focusing on dialogue and participation processes. In 2012, she joined GIZ and her work experiences has since covered Germany, Brussels/Belgium, Burkina Faso, Thailand as well as other African and Asian countries. Besides Thailand, 'Rethinking Plastics' is active in China, Indonesia, the Philippines, Viet Nam, Singapore and Japan to support the transition towards a circular economy for plastics to reduce plastic waste leakage into the sea.



Hery Gunawan Daulay  
Ministry of Marine Affairs and Fisheries, Indonesia

### Abstract

The use of plastics in the world started during the Industrial Revolution in Europe in 1820 with synthetic plastics appearing soon after. After the Leaders Retreat Meeting, G20 Summit in July 2017, the Government of Indonesia committed to reducing waste through 3R (reduce-reuse-recycle) by 30% by 2025, handling waste by 70%, and reducing plastic waste in the sea by 70% by the year 2025. This is of utmost importance to Indonesia, especially for our small islands.

Our oceans support the livelihoods of 2.8 million fishers' households in Indonesia and more than 50 percent of Indonesia's animal protein comes from seafood. It has been estimated that up to 1.29 million metric tons of plastic enter the ocean from Indonesia each year. This has consequences on Indonesia's tourism sector and crucially too, it has an impact on marine life. Additionally, the entry of microplastics into the human body through the food chain is also a matter of great concern. In the long term, the accumulation of these microplastics can turn into toxins that can cause serious diseases for humans for generations to come. Subsequently, marine debris causes damage to coastal ecosystems, inhibiting the growth of mangroves and closing coral reef polyps, which in turn damages the growth of coral ecosystems. Plastic also interferes with the growth of seagrass, and covers other seabed organisms. Additionally, plastic and the nets for fishing gear (ghost nets) harm marine biota through the ingestion of the material and/or with living creatures getting entangled in the plastic nets. Sea creatures such as turtles, dugongs, sharks, manta ray dolphins and others are particularly vulnerable to these harmful activities.

In respect of the management of plastic waste in the ocean, the Government of Indonesia has implemented the Presidential Regulation No. 83/2018 as a National Plan of Action (NPOA). In this NPOA, there are five strategies involving 16 Ministries/Agencies. The details of the RAN include (i) national movement to raise awareness of stakeholders, (ii) land-based waste management, (iii) waste management in coastal and marine areas, (iv) funding mechanisms, institutional strengthening, supervision and law enforcement also (v) research and development.

Some of the MMAF activities in implementing the plastic waste reduction programme in the ocean during 2017-2021 are as follows:

1. Public awareness by implementing the clean-up ocean movements in the 29 locations, with a total of about 412 tons of waste collected.
2. Public awareness involving students by implementing Indonesian Beach Schools (SPI) in 14 locations and Coastal Jamborees in five locations.
3. Providing 22 waste processing facilities in fishing ports and fishing villages and also placing two recycling centre facilities in coastal areas and small islands.
4. 109 fishermen have changed their fishing gear to environmentally friendly fishing gear.
5. Six types of research on plastic waste that enters the sea and its impact on biota and humans have been implemented.
6. Five major fishing ports now have ISO 14001.

Let us combat marine debris and reduce the volume of marine plastic litter entering the ocean, and subsequently manage the remaining plastic waste on land worldwide.

## Profile

Hery Gunawan Daulay, currently serving as Deputy Director of Coastal Restoration, graduated from North Sumatera University (USU) as a Bachelor of Social Economy at 1997. Mr. Hery continued his study in Masters of Agribusiness at Bogor Institute of Agriculture and graduated in 2009. He is currently enrolled as a doctorate candidate of Coastal and Marine Resource Management, Bogor Institute of Agriculture.

During his career in the government sector, Mr. Hery served as:

1. Head of Public Relation Section (2010-2019)
2. Head of Coastal and Marine Resource Management Centre (2019)
3. Head of Sub-directorate of Public Relation and Politic Social Organisation, Pancasila Ideology Development Agency (2019)
4. Deputy Director of Coastal Restoration, Directorate of Coastal and Small Islands Utilisation, MMAF (2020-present)



### Summary of Session

Non-governmental agencies in different APEC member and non-member economies adopt different approaches to reduce marine debris. Swachh Bharat Mission or the Clean India Mission was initiated in 2014 to promote volunteerism and co-ordinate non-governmental efforts. Initially the focus of the mission was on sanitation but has since been expanded to include recycling and municipal solid waste. In Japan, the International Society for Mangrove Ecosystems (ISME) and Iriomote Island Ecotourism Association collaborates through the Eco-Iriomote Island Eco-Project. It is a localized monthly waste collection initiative which gathers on average 5,000 litres of plastic monthly. This amount is sufficient for Styrofoam wastes to be sent to Hatoma Island for conversion into fuel.

Indonesia faces a unique challenge of having many inhabited islands which are under threat of sea-level rise and coastal erosion. This complicates waste collection efforts and engineering methods to reduce erosion such as the Giant Sea Wall Jakarta can cause the accumulation of marine debris. Non-governmental agencies are focused on cleaning up accumulated marine debris and improving waste collection infrastructure.

China faces the challenge of coordinating efforts over a large coastline but has seen success in their National Beach Clean-up Activity, engaging 50,000 participants from more than 100 cities over a 20,000 km long coastline. The activity engages non-governmental agencies such as Green Zhejiang. The “Bay Chief” system has also shown to be effective for coordination with top officials as a ‘Bay Chief’ that are empowered to take steps to control pollution, restore degraded ecosystem and monitor the health of a predefined coastline. This has been incorporated at the county level such as “Sanmen County Government Action Plan”.



**Moderator**

Shantini Rajan  
World Wildlife Fund (WWF), Malaysia

### Profile

Shantini Guna Rajan is a qualified lawyer. She had completed her LLB and LLM from the University of Nottingham. She left legal practice in early 2014 and is currently the Marine Policy Manager with WWF-Malaysia and is humbled by the supporting role she plays in providing policy support for the marine programme. Her policy expertise and interests include marine biodiversity conservation, sustainable ocean management, sustainable fisheries, addressing plastic pollution, climate change amongst others.



Professor Dr Shigeyuki Baba  
World Wildlife Fund (WWF), Malaysia

### Abstract

A local NGO, Iriomote Island Ecotourism Association as Secretariat of the Iriomote Island Eco Project, selects one of the many coastal areas once a month and announces to islanders about the collection of drifted garbage. Islanders and a number of tourists come to the announced site, beaches or sometimes mangrove forests and collect drifted garbage voluntarily. Most of garbage are drifted from outside Japan and over 90% of them are plastic products and separated into styrene foams, plastics/buoys, PET bottles, fishing gears/ropes and others. Collected styrene forms are shipped to the small neighbouring island of Hatoma, where a petrochemical machine is installed for domestic fuels usage, while the others are shipped to Ishigaki Island, as there is no recycling facility on Iriomote Island.

Before the Act for the Promotion of Marine Litter Disposal was issued on 15 July 2009, most of the shipping costs were covered by donations from islanders and some Japanese private companies. After the Act was issued, these costs are mostly covered by the government. However, islanders are still facing tons of coastal driftage which mostly come from outside the island.

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### Profile

Professor Dr Shigeyuki Baba is the Executive Director of the International Society for Mangrove Ecosystems (ISME). He is also Professor Emeritus of the University of the Ryukyus, Okinawa, Japan.

As the Executive Director of ISME, he has organised and implemented a number of projects and training courses and contributed to the conservation and sustainable management of mangrove ecosystems.

A quarter-century of his tireless efforts still continue in line with the conservation and restoration of integrated coastal ecosystems, which provide a wide range of goods and services to communities and our future generations.

He has visited many countries in Asia, Africa, Pacific, the Middle East and Latin America for research and to conduct projects on mangroves, both as Executive Director of ISME and as a technical adviser to national and international organisations.

He has been living on Iriomote, a small, remote island designated as a World Natural Heritage in July 2021. Along the coast, especially in the mangrove forest areas of the island, tons of garbage are drifted. Therefore, besides mangrove research, he has been working on coastal drifted garbage for many years with local NGOs and local communities.



Dr Abdhesh Kumar Gangwar  
Regional Centre of Expertise (RCE) Srinagar, India

### Abstract

Marine debris has its origin not only from the coastal cities but also from the landlocked cities, even though they may be situated quite far away from the sea. Therefore, understanding the interconnectedness, how our homes and cities - coastal as well as landlocked - are closely connected to the sea, is important. How we manage waste, both solid and liquid, in our homes and cities matters for marine debris. Policy and implementation are both important. Participatory planning with governments involving the public and other stakeholders, has proven to be a good practice. Implementing the audit of waste management at all levels, segregation, collection, transportation, management of dumping sites pays good dividend. Awareness and education programmes in schools, villages, communities, like the 5 Rs, less litter, no litter and circular economy, yield good results in inculcating good habits and triggering positive actions. Programmes like the 'National Environmental Awareness Campaign', 'Green Schools', 'Paryavaran Mitra' (Friends of Environment), 'Mehfooz' (promoting total wellbeing), 'Mustaidi' (promoting sustainability, climate and disaster resilience) have yielded good results.

Being primarily a rural economy, India's practice of working with grassroots is important. Capacity building of the Gram Panchayats (Village level governance) towards integrating global targets, like the SDGs, Aichi biodiversity, Paris Climate Agreement, Global Action Plan etc. in their development plans is much needed. Encouraging, motivating and facilitating local actions and connecting them with global initiatives like the 'Blue Flag' certification of the beaches and marinas has helped a lot. 'Blue Flag' is an indication of 100% compliance to 33 stringent criteria and sound health of the beach.

The Foundation for Environment Education (FEE), joined by UNEP, UNWTO and IUCN, regularly conducts monitoring and audits for strict compliance of the 33 criteria. In 2020, eight beaches in India were awarded the coveted 'Blue Flag' certification and in 2021 all the eight beaches retained their position and two more beaches were added to the list, raising the total figure to ten. This is also a global recognition of India's conservation and sustainable development efforts. Indeed, India's national programmes, 'Clean India Mission', 'Litter free cities' are gaining importance and yielding good results. Cleanliness, besides contributing to good health, also improves the economy and livelihood options by promoting tourism and other income generating activities. Clean and healthy beaches have added to biodiversity conservation and ecosystem restoration. Identifying, recognising and promoting successful community initiatives and supporting the change agents further enhance community participation.

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### Profile

Dr Abdhesh Kumar Gangwar is the Coordinator & Focal Point at the Regional Centre of Expertise (RCE) Srinagar, India. RCE is an initiative of the United Nations - University-Institute for the Advanced Study of Sustainability (UNU-IAS), Tokyo, Japan. Formerly, Dr Gangwar was the Senior Programme Director, Centre for Environment Education (CEE India), where he served for over 27 years and was superannuated on 31 July 2018. He has been promoting Education for Sustainable Development and his various engagements aim at achieving a sustainable, climate-smart and disaster-resilient community.

RCE Srinagar has taken up various initiatives to educate and motivate people towards reducing their footprint and increasing their hand print, promoting positive actions towards sustainability, achieving Sustainable Development Goals across India and the Asia-Pacific Region. RCE Srinagar formed and launched 'Asia Pacific RCEs Disaster Risk Reduction (DRR) Network' and has been promoting disaster preparedness and resilience across the Asia-Pacific Region.

RCE Srinagar's various projects have been awarded by UNU-IAS, RCE Recognition Awards as Outstanding Flagship Projects for the 2016 'Climate Smart and Disaster Resilient Communities in the Indian Himalayan Region', in 2019 for 'Mainstreaming Disaster Risk Reduction Making India Climate Smart, Disaster Resilient and Sustainable' and in 2020 for 'Empowering Community for Combating COVID-19 Pandemic'.

RCE Srinagar is continuously engaged in empowering village and urban local bodies' level governance systems, working towards making their development plans participatory, inclusive and integrating Sustainable Development Goals in their implementation.

Dr Gangwar is a Board member of the 'International Alliance for COVID-19 Community Response' (IACCR) and has contributed a great deal towards combating the COVID pandemic globally. The research work of Dr Gangwar and his group has been cited in the Intergovernmental Panel on Climate Change (IPCC) 4th Assessment Report 2007 which won the Nobel Peace Prize for 2007.

## Action of NGO in Promoting Coastline Clean-up: The Case of Coastal Clean-up in Sanmen County, China



Hao Xin  
Green Zhejiang, China

### Abstract

Sanmen county is located in the middle of China's golden coastline, with a total length of 315 kilometres and a sea area of 482 square kilometres. Sanmen is famous for its small seafood production and it is the largest county in Zhejiang Province for marine aquaculture. A large number of foam floats used by fish farmers, household garbage as well as discarded fishing nets have critically impacted on the coastal environment of Sanmen. In this case, Green Zhejiang, a Chinese environmental NGO, promoted the coastal clean-up activity in Sanmen through the cross-border cooperation with the China Ocean Development Foundation and the Sanmen County Government. Green Zhejiang established a long-term coastal clean-up alliance and formulated counter measures and suggestions through a special investigation to promote the effective development in conserving the Sanmen coastline environment.

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### Profile

Xin Hao is the co-founder of Green Zhejiang, the first and largest environmental NGO in Zhejiang. He obtained his bachelor's degree in Environmental Science from Zhejiang University and has two Master's degrees in Environmental Science & Policy and Geographic Information Science from Clark University. Currently, he is undertaking a PhD in Entrepreneurship Management at Zhejiang University. In 2000, Xin Hao cycled more than 2,000 kilometres across Zhejiang province for 36 days. During his journey, he encountered many water resources in Zhejiang that were polluted and the situation was seen as critical. It was a stark awakening for him and he realised that he needed to do something to change the situation he had come across. Upon his return, with his professor, he launched an NGO called Green Zhejiang. In the past 21 years, Xin Hao has undertaken substantial environmental conservation work. For example, he developed an interactive collaborative pollution map which won the UNEP Eco-Peace Leadership 'Urban Planning Excellence Award'. Besides this, he promoted the idea of a 'citizen river chiefs' policy, which resulted in him being nominated as the head of Hangzhou's citizen river chief.

Currently, Xin Hao is dedicated to education for sustainable development. He organised a programme called 'River Angels' which won him the United Nations University's Global RCE Network Flagship Excellent Award in 2019. In addition, he also launched different types of programmes in Zhejiang, such as the Earth Successor programme, beach cleaning network etc. He has now delivered over 500 speeches around the world and has an audience of more than 80,000. For his ongoing efforts in environment and sustainable development, Xin Hao was honoured with the Youth Elite Medal of China, the China Ecological Civilisation Award, the China National Mother River Award and the Golden Medal of China for Voluntary Service.

# Marine Pollution, Social and Environmental Challenges: An Indonesian Coastal Community's Perspective



Dr Lin Yola  
Universitas Indonesia, Indonesia

## Abstract

As the world's largest archipelago nation, Indonesia faces a long-term challenge of building strong coastal resilience. Rapid development and economic forces intensively bring about environmental degradation as a consequence. This includes the challenges posed by marine pollution. Notably, marine pollution and coastal communities are pinpointed as inseparable, causally interrelated subjects that have impacted on Indonesian coastal areas' social and ecological issues. Tough living with nature is an integral part of the history of coastal livelihood and local communities are forced to adapt to the development of marine pollution issues. Nevertheless, informal fishermen villages have been responsible for contribution towards marine pollution itself. Cases from Indonesian states bring ongoing challenges within a local context. A long-term focus on risk mitigation and adaptation was strategised but the gap between issues and policies was still present. Thus, enforcing a responsive and holistic strategy and action remains a significant challenge in building the coastal resilience target in Indonesia.

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## Profile

Dr Lin Yola is a Senior Lecturer at the School of Strategic and Global Studies, Universitas Indonesia, with a strong academic and professional background in urban and energy. She is best known for her model of 'Climatically Responsive Urban Configuration'. Her significant work influences planners and stakeholders to confront climate challenges, facilitating the strategising of urban spaces to create conducive living in city areas. She believes that urban and regional development urgently needs global ecological and social justice. Her projects and publications also promote technology innovation as the strategic methodology in addressing global development issues.

Dr Lin Yola has years of experience in an academic and administrative position in several international university programmes. Currently, she is the Manager at the International Collaboration Division of the School of Strategic and Global Studies, Universitas Indonesia. Dr Lin Yola is also highly active as a Publication Editor and Reviewer, Curriculum Developer and International Event Chairman and has been involved in various community services.

## Role of Public-Private Partnership in Addressing Marine Debris

### Summary of Session

Private companies and stakeholders have an important role in promoting uptake of technology and monitoring the sources and distribution of marine debris. Heng Hiap Industries based in Malaysia is one such industry leader that has established a smart factory for producing reusable plastic resin from solid waste and marine debris. The factory is equipped with rainwater harvesting, building orientation to maximize natural ventilation and lightning. It also has a pyrolysis plant for converting waste to liquid fuel which can generate renewable electricity up to 1MW.

In Chinese Taipei, The Plastics Industry Development Center (PIDC) develops supply chains from which collected marine debris can be converted into usable consumer goods. Companies in their Ocean Plastic Coalition has successfully produced sunglasses from collected fishing nets for brands like Decathlon and Julbo.

Speakers also spoke about the importance of engaging members of the community. Youth engagement is an important means to promote behavioural change and co-production promotes technology uptake and fill in the gaps for monitoring of marine debris. Co-production or citizen science where knowledge is produced by collaboration between stakeholders and technical experts. MIGHT, a Malaysian government linked technology think tank is an advocate of the READI (Resources, economic, accessibility, digitalization, institutional) framework for enhancing supply chains.



**Moderator**

Jacqueline Chang  
Circular Economy Institute, Malaysia

### Profile

Ms. Jacqueline Chang is a Senior International Development Expert with 17+ years of extensive senior-level programme & project management experience in Southeast Asia region. She has implemented 16 projects in collaboration with ASEAN economies; such as UNEP & COBSEA's regional project SEA circular (supervised & completed circular economy pilot projects case studies in Penang (circular plastic solutions) and Petaling Jaya (voluntary EPR) during the Covid-19), to promote EU-Malaysia-ASEAN cooperation within Malaysia and at the city level in circular economy initiatives, SCP policy support (Prime Minister's Department) to accelerate the development of a green and blue economy. Most notably, her circular economy experience includes working on circular cities (Malaysia's Blueprint for Circular Cities) for the IUC-Asia project (Phase 1) financed by the EU and she is now appointed as the IURC Country Coordinator | Circular Economy Specialist for Phase 2 IURC Programme under the IURC Asia-Australasia regional team for city-to-city cooperation under the global thematic network – circular economy waste management. As a CEC Leader for Circular Economy Clubs in Malaysia (appointed with license), she implements various circular economy initiatives with the quadruple helix network (e.g. closing the loop & advancing plastic recycling case study), executing pilot projects and participated in the Malaysia's Circular Plastics Economy Roadmap national consultation meetings. She holds a master's degree in International Business and is certified in Project Cycle Management, Proposal Writing for Civil Society Organisations and Local Authorities, Business Sustainability Management (Cambridge Institute for Sustainability Leadership), Principles & Business Models in a Circular Economy, Evaluation Management by UN System Staff College, Monitoring and Assessment of Marine Litter & Microplastics and Marine Litter Leadership & Expert tracks sponsored by UNEP. She is fluent in English and Bahasa Malaysia. She also converses in Cantonese and obtained her FLE (Français Langue Etrangère) B1 certificate in 2011 (Lille, France). Her international work experience includes working with clients and she has implemented projects in 16 economies under her legal career track and later in her international development portfolio track from 2000 till to date.



Cheng Hsiu Tsai (Damon)  
Plastics Industry Development Center (PIDC), Chinese Taipei

## Abstract

The Plastics Industry Development Center (PIDC) is a professional institution for plastics technologies in Chinese Taipei. The mission of PIDC is to promote the plastics industry using advanced technology, driven by its capabilities in material R&D, professional testing lab and sustainable consulting skills. PIDC assists local enterprises to keep up with the circular economy trend, working towards better sustainable development.

With the involvement of its upstream and downstream industrial partners, the centre established the Ocean Plastic Coalition (OPC) on 22 April 2018 in conjunction with Earth Day. The OPC coalition's initiative revolves around transforming ocean plastics into consumer products as the solution to the problem of marine debris. It has succeeded in its mission in producing many short-term endeavors. With OPC members creating products made of ocean plastics such as fountain pen from PET bottle and sunglasses from waste Nylon fishing nets etc. However, the sustainable business model for ocean plastic recycled products requires a stable source of marine waste supply which depends on a reliable collecting system and a strong connection of industrial cluster.

In recent years, the Ocean Conservation Administration, the local maritime authority has launched several projects and initiatives to deal with marine debris for the protection of the eco systems. These include providing subsidies for collecting waste fishing gears and undertaking the reinforcement of fishing port infrastructures. With this public-private partnerships, efforts towards creating better eco marine systems are improving.

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## Profile

Damon is a consultant for sustainable development at the Plastics Industry Development Center (PIDC), providing comprehensive consulting services to enterprises on CSR, material flow, carbon footprint management and many other environmental issues. He is also currently actively helping PIDC to establish the Ocean Plastic Coalition (OPC), which is a voluntary local circular economy cluster united by industrial upstream and downstream private sectors, aiming to turn ocean plastics into consumer products through the utilisation of knowledge and manufacturing capabilities. The coalition has many successful practices in making products out of ocean plastic waste. Besides common ocean plastics, both PIDC and the OPC have been working on building a waste fishing gears recycling business model in recent years.





Saah Kian Hoe  
Heng Hiap Industries (HHI), Malaysia

### Abstract

- HHI believes that we do not have a plastic pollution problem but a plastic ignorance problem.
- Fragmentation in plastic recycling landscape is the key challenge in developing countries.
- Integration is the key to creating value in the entire value chain.
- Plastic could be valorised continuously by changing its form and shape through mechanical and chemical recycling.
- When digitalisation meets sustainability, magic happens.
- We collaborate with partners to offer Ocean Bound Plastic chairs with QR coded traceability.
- We coordinate the fragmented, informal community through digitalisation.

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### Profile

Seah Kian Hoe ('Kian') is the founder and managing director of Heng Hiap Industries (HHI). Established since 2002, HHI has been at the forefront of developing and innovating plastic recycling technology.

Having developed Smart Plastics to address plastic manufacturers' need for high quality, customised recycled plastic resin, Kian also designed the Smart Factory in Johor Bahru from the ground up. The factory is GBI-certified (Green Building Index) Gold and is now producing PLASHAUS Ocean Plastic while implementing a full track-and-trace programme which directly addresses plastic consumers' concerns about marine pollution.

HHI Smart Plastics has reached the shores of 35 economies globally including China, Japan, Australia, India, and multiple economies in Europe, meeting customers' high-performance standards and stringent requirements in quality. HHI is the only Asian company participating in Bioplastics Europe, a project sponsored by the European Commission to develop and implement sustainability-based solutions for bio-based plastic production and use. Kian is also an active committee member of the Malaysian Plastic Manufacturers Association (MPMA).

In the last 18 years, Kian and HHI have won multiple accolades for business leadership and product innovation – the more notable ones being: the Junior Chamber International (JCI) Ten Outstanding Young Persons (TOYP) in the World in the category of environmental leadership (2013). The Edge newspaper of Malaysia named him 'The Michelangelo of Recycling' (2018) and most recently, Frost and Sullivan awarded HHI the '2020 Malaysia Smart Waste Solutions Technology Innovation Award'. Besides his bachelor's degree in Mechanical Engineering, Kian obtained an MBA from the American Graduate School of International Business at Thunderbird University, Arizona, USA under the Fulbright Research and Development Scholarship in 2000.



Saltanat M Kazi  
The Energy and Resources Institute, India

### Abstract

Waste discharged into the coastal or marine environment on account of anthropogenic activities is known as marine litter. Currently, India is the 12th largest source of marine litter and is anticipated to become the 5th largest source by 2025. 80 per cent of total marine debris originates from land-based sources which is either directly dumped into the ocean or gets carried to flowing water bodies through storm/open drains/runoff, which in turn gets discharged into the seas. One of the largest components of marine litter is plastic and the river Ganga is documented as one of the top five rivers responsible for dumping plastic into the Oceans. India consumes 16.5 mt of plastic annually (2017-18) of which 43% is single-use plastic, thus highlighting the prevailing gravity of the issue.

This titanic issue that plagues our oceans needs multi-level interventions covering policy, regulations, compliance, sustainable alternatives and innovations in waste management and disposal. In addition, there has to be attitudinal and behavioural change as well as advocacy and support from different stakeholders. One important stakeholder is the youth as they are the future citizens who need to take cognisance of the prevailing issues and work towards addressing them at the individual, family and community level.

Keeping this in mind, a school education programme was designed and implemented in the city of Mumbai, India, as part of the larger project-SEARCH an acronym for Sensitisation, Education and Awareness on Recycling for a Cleaner Habitat. The project was implemented in seven locations across India in association with Tetra Pak Private Limited.

The objective of Tetra Pak Private Limited was to promote awareness that Tetra Pak packaging was completely recyclable and to promote correct disposal practices so as to enhance the financial viability of recycling. This programme was carried out in 30 schools across the city which holistically combined knowledge, skills and competency building, enabling action amongst educators and students. A dry waste collection system was established in schools to channelise dry waste for recycling and a rigorous monitoring system was developed to document and track the collection.

The success of the project could be measured in terms of the campaigns, projects and initiatives led by students or the amount of dry waste channelised for recycling. There is a need to ensure that such success stories are amplified so that more youth are engaged. The pre-requisites and role of institutions will be further detailed in the session.

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### Profile

Saltanat Kazi's expertise lies in research, training, education and outreach in the realm of sustainable development. She has carried out policy research and sectorial impact assessment by integrating quantitative and qualitative methods in the area of tourism, mining and natural resource management through stakeholder engagements to translate the findings into action. In the area of training, she has expertise in designing modules and content for outcome-based training programmes and has facilitated interactive training programmes for youth, educators and government officials. The aim has been on deepening the learning curve by using innovative teaching learning strategies, designing and developing resource materials and teaching aids to enable transformative learning. Policy advocacy and outreach has been another area that she has been engaged in, through consultative workshops, webinars, conferences and campaigns, using customised tools to measure and monitor impacts. She has several publications to her name, including books as well as articles in journals, newspapers and books.



Professor Dr Richard Bellerby  
SKLEC-NIVA Centre for Marine and Coastal Research, China

### **Abstract**

Anthropogenic and climate perturbations are challenging the resilience, robustness, and productivity of coastal systems. Approaches to deliver measures to ameliorate habitats are often performed on single drivers which do not reflect the multi-dimensional nature of changing stressors; nor do they provide the strategic advances required to enable effective mitigative and adaptive approaches. In addition, local knowledge is crucial in the design of coastal protection efforts. Information on stressors state, variability and trends must be tailored to each system and their system services. In many respects, local stakeholders have an alternative understanding of the system than scientists. The resultant co-production of science drives a more efficient delivery of new knowledge, increases the reception and relevance of new scientific understanding which can lead to a more secure and productive system management.

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### **Profile**

Director, SKLEC-NIVA Centre for Marine and Coastal Climate Research, State Key Laboratory for Estuarine and Coastal Research, East China Normal University

Chief Scientist, Norwegian Institute for Water Research, Bergen, Norway



Dr Raslan Ahmad  
Malaysia Industry-Government Group for Higher Technology (MIGHT), Malaysia

### Abstract

Malaysia is the 28th top plastic global polluter and the eighth top contributor to plastic marine debris in the ocean. This is due to several factors such as inefficient and uncontrolled disposal practices, lack of comprehensive waste management practices and low awareness among the public. In response to the abundance and distribution of marine debris on Malaysian beaches, a new mechanism is required to address marine debris sustainably. Private-public partnership (PPP) is identified as one mechanism for both the private and public sectors to work together in addressing the problems. The public and private sectors will have a vast number of opportunities to collaborate and thus position the sustainability efforts to achieve a national goal. The READI and FIRST framework will provide guidelines for the partnership, allowing it to be implemented comprehensively. A national think tank, MIGHT operates on the foundation of rapid technological change and partnership with key stakeholders from the industry, government and academia to produce multiple deliverables, such as policy, programmes and catalysts projects for industry cluster development. To demonstrate how MIGHT and key partners have established partnership footprints in related sectors, a number of partnerships case studies between MIGHT and state governments are discussed.

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### Profile

Raslan has held a number of high senior management positions in key government agencies over the past thirty years. He is currently a Senior Vice President of the Malaysian Industry-Government Group for High Technology (MIGHT), an agency under the Prime Minister Department. Raslan led the MIGHT International team to provide secretariat ship for the Global Science Innovation Advisory Council (GSIAC), together with the New York Academy of Sciences from 2012-2017.

He drives strategic initiatives in the area of clean, green and renewable energy, sustainable cities and communities and Industry 4.0. Raslan was appointed as National Programme Director for Global Sustainable Cities Integrated Approach Pilot Project for Malaysia which is funded by Global Environment Facility (GEF) and United Nations Industrial Development Organisation (UNIDO). Raslan was also appointed as National Programme Director for UNIDO Smart Grid Project Valued USD 1.5 Million and Forged Collaboration between MIGHT, TNB Energy Services, Lembaga Lebuhraya Malaysia for the Green Energy Programme and generated RM20 Million Energy Saving for Highway Operators.

Prior to joining MIGHT, Raslan was the Founding Chief Executive Officer (CEO), Yayasan Inovasi Malaysia (YIM an entity under the purview of the Ministry of Science, Technology and Innovation (MOSTI)). He pioneered the establishment and operationalisation of YIM as a new entity under MOSTI to champion grassroots innovation. He secured RM10 Million seed money for YIM and successfully led the set-up of the organisation, governance, team, processes and key programmes and projects.

Raslan created Jejak Inovasi (Innovation Scouting), KidEvents and Kuala Lumpur Innovation Forum as key initiatives under YIM to cultivate grass root innovation among Malaysians. Under his leadership, he secured RM1 Million annual contribution from the private sector annually i.e., Exxo-Mobil and Bank Rakyat for YIM's programmes and activities. He also established YIM Technology Sdn Bhd as YIM Business Unit to commercialise inventions by grassroot innovators.

Formerly the Under Secretary of ICT Policy Division, MOSTI, from 2006-2009, he covered major areas of ICT policy planning, implementation and monitoring. He was entrusted with coordinating and managing ICT Cluster, including the supervision of ICT agencies (i.e., Multimedia Development Corporation, MIMOS, Cyber Security Malaysia and .my Domain) and their programmes (i.e., MSC Malaysia, Knowledge Grid Malaysia, ICT for All Program etc.).

He has also led the National ICT Council Secretariat, managed e-Content and Demonstrator Application Grant Scheme (DAGS)/fund, monitored the implementation of National ICT Roadmap and National Cyber Security Policy and coordinated the ICT international cooperation. As Undersecretary of ICT Policy, Raslan chaired several National ICT Committees i.e., ISC G - Industry Standards Committee on Information Technology, Telecommunications and Multimedia, e-Content and DAGS Evaluation and Disbursement Committee.

Raslan started his career 30 years ago as the Coordinator for Corporate Planning Division of MIMOS (Malaysian Institute of Microelectronic Systems) and grew with the government R&D power house through its corporatisation process along the years. Among Raslan's contribution to MIMOS includes playing a key role in the corporatisation of MIMOS Bhd, facilitating the establishment of partnership and distributing labs with industry partners, locally and internationally (e.g., Korea Electronics Technology Institute, Fraunhofer Germany and Industrial Technology Research Institute of Taiwan).

Raslan gained a B.A. (Hons.) Degree in Southeast Asian Studies and Master of Philosophy in Human Development at the University of Malaya in 1987 and 1991 and PhD in Science Policy and Technology Management at Policy Research in Science, Engineering and Technology (PREST), an institute of the University of Manchester in 1999. With over 16 years of experience in MIMOS, more than 6 years in MOSTI, 2 years in YIM and 8 years in MIGHT, Raslan brings with him a wealth of experience in corporate planning, R&D management, government and universities alliances. He has extensive experience in science governance at the national and international levels. He has always worked very hard in whatever he chooses to do and that is his one true strength.

Raslan has been awarded the Fellow of Academy Sciences for 2018 under Science, Technology and Innovation. This award is given by Academy of Sciences Malaysia to those who have outstanding achievement, leadership or contributions to science, engineering and technology.

### Summary of Session

This session on Technology and Innovation for Sustainable Coastal Cities is a two-part session moderated by Professor, Ts. Dr Mohd Hafiz Dzarfan Othman and Professor Dr Mohd Razman bin Salim. Much of the technologies and innovation discussed deals with solid waste which contributes to marine debris but also other related issues such as ecosystem robustness, food production and water resources. Marine debris applies stress to ecosystem in addition to those from climate change and this has led to some unique geographical interactions between different species with migration causing co-occurrence. Increased species interaction has been shown to reduce sensitivity and increase robustness in fisheries. But there is also a worrying report of microplastics accumulating in *Asterias rubens* star fish and polychaetes marine worm species. These benthic organisms are an important part of the marine food-chain.

There was also a discussion on gathering data on distribution of plastics. Good information can be obtained from drifters as well as plastic surveys during beach clean-up activities. It was found that 83% of litter accumulated on beaches are plastics much of it comes from food packaging. Such data is captured using Citizen Science Literati Audit App. Using drifters, the distribution of debris by ocean currents can be mapped and it was reported that debris have a wide distribution range which crosses continents.

Speakers also highlighted the technical requirements of their local situation. Indonesia with insufficient infrastructure on small islands is developing incinerator vessels to help with waste disposal. Singapore with their limited space but good infrastructure is developing AI precision aquaculture which has a much smaller carbon footprint and minimal leakage of plastics. AI driven reverse vending machines were also discussed as a means to promote behavioural change. Island populations that are reliant of reverse osmosis for drinking water may also be affected by microplastics even though microplastics can easily be removed by reverse osmosis. Microplastics has been reported to stimulate microbes to secrete extracellular polymeric substances which causes biofouling.



Moderator

Professor, Ts. Dr Mohd Hafiz Dzarfan Othman  
Universiti Teknologi Malaysia

### Profile

Ts. Dr. Mohd Hafiz Dzarfan Othman is a Professor in School of Chemical and Energy Engineering and also Director of HICoE Advanced Membrane Technology Research Centre (AMTEC), Universiti Teknologi Malaysia (UTM). He received Bachelor of Chemical Engineering and Master of Gas Engineering from UTM in 2004 and 2006 respectively, and PhD from Imperial College London, United Kingdom in 2011.

His research focus lies on the development of inexpensive membranes for environmental protection and energy generation. He is the pioneer in the fabrication of inexpensive ceramic hollow fibre membrane made from waste materials such as palm oil fuel ash, rice husk ash, fly ash, kaolin, ball clay, natural zeolite and bauxite. He and his team have demonstrated the use of those membranes in many water and wastewater treatment applications with an outstanding performance in seawater desalination, heavy metal and ammonia removal, organic contaminant degradation and oil-water separation. He is also currently developing a miniscule version of fuel cell which is known as micro-tubular solid oxide fuel cell (MT-SOFC) and this device is capable to generate high volume of electricity by using biogas and methane as the direct fuels. He has been leading more than 50 projects includes 6 international grants, 5 industrial/consultancy projects, and 1 community project that worth over RM6 million. Through these research projects, he has filed more than 30 patents and published over 380 indexed articles with H-index of 36. He is also the main supervisor for 36 PhD students (18 graduated) and 10 Master students (8 graduated).

## Technology and Innovation for Sustainable Coastal Cities

In recognitions for his scientific contributions, he was awarded several research awards, including Top Research Scientist Malaysia (TRSM) 2019, MASS Young Researcher Award 2018, Hitachi Scholarship Research Support Program 2018, Aseanian Membrane Society (AMS) New Member Special Award 2018 in Australia, Best Research Award and Indexed Journal Author Award in Citra Karisma UTM Quality Day 2018 and 2017, Malaysia representative for 2017 Asia-Pacific Economy Cooperation (APEC) Science Prize for Innovation, Research and Education (ASPIRE Prize), finalist of National Young Scientist Award 2016, two fellowship awards namely Short-Term Research Program in Japan (SRJP) and Short-term Visit Program in ASEAN (SVAS), which both awards were given by ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN-SEED) and, Best Oral Presenter Award in UTM Research University Grant Colloquium 2016 which entitled him to receive a research grant worth RM20,000.

Some of the research inventions have also been recognized at the national and international level by winning several innovation awards, for instance two times winner for the Best of the Best Award in Industrial Art and Technology Exhibition (INATEX2019 and INATEX 2017), Special Award in Seoul International Invention Fair (SIIF) 2017, and Asian Invention Excellence Award in 28th International Invention, Innovation & Tehnology Exhibition (ITEX'17). One of his inventions entitled "Sil-RH Membrane Distillation: From Seawater to Drinking Water" has been selected in the Enabling Intellectual Property Environment (EIE) program under World Intellectual Property Organization (WIPO). He is also one of the board of director of UTM spin off company named as Filt Us Sdn. Bhd. which commercializing the filter-based water treatment product.

As the contribution to the nation in inculcating young generation's interest towards science, technology, engineering and mathematics (STEM) subjects, he had involved in a number of high impact program under the umbrella of Young Scientist Network (YSN)-Akademi Sains Malaysia (ASM). For instance, he had been entrusted to be the chair of the organizing committee of National Science Challenge 2018, which is the largest science competition for high school students in Malaysia. Furthermore, he has been appointed as Secretary General and executive committee (Exco) of YSN-ASM in 2020 and 2018 respectively. He is also a member of prestigious and very selective international young researcher association, Global Young Academy (GYA). The GYA provides a rallying point for outstanding young scientists from around the world to come together to address topics of global importance.



Professor Dr Mohd Razman bin Salim  
UCSI University, Malaysia

### Profile

Professor Dr. Mohd Razman Salim joined UCSI University in December 2019. Currently, he is attached with the Department of Civil Engineering, Faculty of Engineering, Technology and Built Environment, UCSI University. Dr Razman received his BSc of Civil Engineering from Brighton Polytechnic, UK (1980); Masters in Civil Engineering (Sanitary) from North Carolina State University, USA (1985); and PhD Environmental Engineering from University of Newcastle upon Tyne, UK (1992). He began his academic career as an Assistant Lecturer at Universiti Teknologi Malaysia (UTM) in September 1980. He was appointed as Deputy Director, Institute of Environmental Management and Water Resource (IPASA), a research institution in UTM. Before that he held the post of Head Department of Environmental Engineering at the Faculty of Civil Engineering, UTM.

Dr. Razman was awarded a Commonwealth Fellowship (Association of Commonwealth Universities) in 1998 to develop research for a year in the field of biotechnology at University of Newcastle upon Tyne. From 1996-2002, he was appointed the University coordinator and research fellow for JSPS/LIPI-DOST-VCC programme in Biotechnology. As a researcher under CICHE, SIDA and DUCED programmes, he carried out study on capacity building in wastewater treatment technology and solid waste management. He was involved in more than 60 research and consultancy projects, publishing more than 180 articles, both in journals and proceedings, filing seven patents, including two patents granted. He was appointed as a member for a task force by the Akademi Sains Malaysia, involving in a study on water and wastewater management in Malaysia. He was also one of the researchers conducting study on the project "Low Carbon Society for Iskandar Regions" under sponsorship of JICA. He is the member of International Water Association (IWA) and one of the council members of Malaysian Water Association (MWA). He is also the committee member for a registered NGO called Malaysian Society of Waste Management and Environment (MSWME).

# The Contemporary Impacts of Macro-Ocean Litter and Climate Change on Marine Environments and Species



Dr Chia-Ying Jessie Ko  
National Taiwan University, Chinese Taipei

## Abstract

Climatic changes are expected to redistribute species, altering the strengths of species interaction networks, while ocean litter is of growing global concern, increasingly impacting on marine environments and ecosystems. However, large-scale evaluations for the two aforementioned impacts remain elusive. We explored novel ways to understand their impacts. For marine species, one way to infer species interaction networks is by analysing their geographical overlaps. This provides indices of species interdependence, such as mean spatial robustness (MSR), which represents the geographical impact of a species on other species, and mean spatial sensitivity (MSS), which indicates how a species is influenced by other species. Integrating MSR and MSS further allows us to assess community coexistence stability and structure, with a stronger negative relationship between MSR and MSS (i.e., species are unequally dependent on each other) within a community at a given time suggesting a more stable community.

For ocean litter, from a management perspective, natural drifting of macro-ocean litter to or near the coast may have a relatively easier opportunity to be cleaned up directly from land, which then helps eliminate litter sufficiently and reduces the associated societal costs. The wind is critical to restructuring litter distributions in locations greatly different from those within the gyres where litter is typically found, prompting strong concerns regarding previously ignored areas, especially the equatorial zone and northern polar regions. Different proportions of offshore and coastal source litter exhibit different terminal configurations, including floating offshore, floating near the coast and being washed ashore. These can provide support for regional-to-global actions and influence policies on addressing the contemporary impacts of climate change and ocean litter on ecosystems and environments.

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## Profile

Dr Jessie Ko is an Associate Professor at the Institute of Fisheries Science, Department of Life Science & Department of Biochemical Science and Technology, National Taiwan University, Chinese Taipei.



# Microplastic Contamination in The Arctic Benthic Organisms: Current Knowledge, Challenges, and Future Perspectives



Dr Chao Fang  
Ministry of Natural Resources, China

## Abstract

Chao Fang<sup>1</sup>, Ronghui Zheng<sup>1</sup>, Fukun Hong<sup>1</sup>, Min Zhang<sup>1</sup>, Yusheng Zhang<sup>1</sup>, Longshan Lin<sup>1</sup>, Jun Bo<sup>1\*</sup> (1Third Institute of Oceanography, Ministry of Natural Resources, Xiamen, 361005; \*Jun Bo, E-mail: bojun@tio.org.cn)

Microplastics (MPs) in the Arctic have raised increasing concern but knowledge on MP contamination in benthic organisms from Arctic shelf regions, e.g., the Chukchi Sea, is still limited. The Chukchi Sea may act as an important conduit that promotes the migration of MPs from the North Pacific Garbage to the Arctic. Meanwhile, the Chukchi Sea is one of the most productive marine ecosystems in the world and the various benthic organisms serve as important food sources for marine mammals and seabirds. Therefore, we provided the first data on the abundances and characteristics of MPs in a total of 413 dominant benthic organisms, representing 11 different species inhabiting the shelf of Bering and Chukchi Seas in 2017.

The mean abundance of MP uptake by the benthos ranged from 0.04-1.67 items individual<sup>-1</sup>. The highest value appeared at the northernmost site, implying that the sea ice and the cold current represent possible transport mediums. The predominant composition was polyamide (PA), followed by polyethylene (PE), polyester (PES) and cellophane (CP). In 2018, we further assessed the MP pollution in the three most common benthic species from the Chukchi Shelf. The mean MP abundances in the sea anemones ranged from 0.2 items/individual to 1.7 items/individual, which was significantly higher than that in the deposit-feeding starfish (0.1-1.4 items/individual) and snow crabs (0.0-0.6 items/individual). The top three compositions of MPs in the three species were PES, PA, and PET. Sea anemones inhabiting lower latitudes ingested relatively higher levels of MPs than those inhabiting higher latitudes. Rapid sea ice loss may accelerate MP accumulation in sea anemones. Overall, we found that there was a significantly positive correlation between the trophic levels and MP burdens of organisms, suggesting that the trophic transfer of MPs through benthic food webs should receive more research attention. The MPs in the benthos from the Chukchi Sea might originate from the melting sea ice, fishery activities and ocean currents.

The challenges are as follows:

- The standardised approaches to survey the MP pollution in the Arctic benthos have not been established.
- The long-term data on the spatio-temporal variation of MP pollution in the Arctic is lacking.
- It was difficult to ensure that the sampling stations and collected organisms remained identical over the different voyages.
- The approaches to monitor the MPs in the sea ice and atmosphere have not been established.
- The research on the biological effects of MPs on the benthos is in a blank state.
- The rule of trophic transfer of MPs within the benthic food web remains largely unknown.

In future studies, the following directions need to be taken and strengthened:

- Setting up the unified and standardised approaches to survey the MP pollution in the Arctic benthos.
- Long-term investigations into MP contamination are urgently required to improve the understanding of the environmental fate and transportation of MPs among the different Arctic environmental compartments.
- Enhancing the study on the relationships among the MP pollution, ocean current movement, sea ice migration, chlorophyll and ice algae abundance, nearshore river input and human activities.
- Clarifying the fate, distribution and source of MPs.
- Further revealing the rule of trophic transfer of MPs within the benthic food chain, obtaining the appropriate bioindicator of MP pollution in the Arctic.
- Studying the effects and mechanisms of climate change on the fate, distribution and biological effects of MP pollution in the Arctic.

Key words: Microplastic, Arctic, Chukchi Sea, benthic organisms, Climate change

### **Acknowledgments**

This work was sponsored by the Chinese Arctic and Antarctic Administration, the first batch of the Youth Innovation Fund Project of Xiamen in 2020 (3502Z20206099), the National Key Research and Development Program of China (Grant No. 2019YFD0901101) and the National Natural Science Foundation of China (Grant Nos. 41977211 and 41722605).

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### **Profile**

Dr Chao Fang is an Associate Professor of Marine Science in the Laboratory of Marine Biology and Ecology, Third Institute of Oceanography, Ministry of Natural Resources, China. He received his PhD degree from the Chinese Academy of Sciences in China in 2015 following completion of his Master's Degree in Xiamen University, China. He was a Visiting Researcher in Yamanashi University, Japan (2012-2013). In 2018, Dr Fang carried out a joint investigation on coastal pollution in the Klang Straits in Malaysia with University of Malaya. His scientific focus is on the transformation, transportation, bioavailability, toxicology and risk assessment of classic and emerging contaminants such as petroleum hydrocarbons, organotin, microplastics and antibiotic in the nearshore ecosystems, ocean and pole regions. Recently, Dr Fang devoted his work to studying the occurrence, fate, sources and trophic transfer of microplastics in the benthic organisms from the Arctic in relation to climate change undertaken in three voyages of the Chinese National Arctic Research Expedition. In addition, Dr Fang also focuses on the microplastic and antibiotic contamination in the mangrove ecosystem which aims to reveal the main sources of pollutants as well as select the ideal bioindicator and biological indexes to achieve early warning. In the last three years, he has authored more than 20 peer-reviewed international journal articles.



Associate Professor, Dr Goh Pei Sean  
Universiti Teknologi Malaysia

### Abstract

Desalination can provide a sustainable source of fresh water. Desalination is necessary with the growing coastal population for ensuring the sustainability of current water resources. Portable water shortages occur because of pollution, climate change, and deforestation. Reverse osmosis using membranes is low energy, compact and can be fully automated for easy maintenance. Microplastics are usually rejected by reverse osmosis systems and are excluded from the filtrate. However, disposing of them from the reject streams would be a challenge. Increased microplastic pollution may also reduce membrane lifetime via fouling. This necessitates protecting the reverse osmosis system via pretreatment of seawater using screening and ultrafiltration techniques. Surface modification of filtration membranes can reduce fouling and enhances microplastic rejection. Microplastics have also been reported to stimulate microbial activity which increases extracellular polymeric substances (EPS) which would promote biofouling.

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### Profile

Dr Pei Sean GOH is an Associate Professor of Chemical and Energy Engineering at the Faculty of Engineering, Universiti Teknologi Malaysia (UTM). She received her PhD in Gas Engineering in 2012 from UTM. Pei Sean is a Research Fellow of the Advanced Membrane Research Technology Research Centre (AMTEC), UTM. She is also the Head of Nanostructured Materials Research Group at UTM. Her research interests focus on the synthesis of a wide range of nanostructured materials and their composites for membrane-based separation processes. She also focuses the applications of carbon-based nanomaterials and polymeric nanocomposite membranes for acidic gas removal as well as desalination and wastewater treatment. Pei Sean has authored and co-authored more than 200 research papers. Currently, she is the associate member of the Academy Sciences Malaysia and a member of the Global Young Academy. Pei Sean is also the recipient of L'Oréal-UNESCO For Women in Science 2020.



Dr Kuit Sui Hyang (Vivian)  
Blue Communities, Malaysia

### **Abstract**

Marine plastic pollution is a global issue that is also recognised as a major concern in the Tun Mustapha Park in Sabah, Malaysia. The Global Challenges Research Fund (GCRF) Blue Communities Research Programme aims to build capacity for sustainable interactions with marine ecosystems for the health, well-being, food and livelihoods of coastal communities. In order to understand the human dimension of marine plastic pollution and its potential solutions, the Blue Communities-University of Malaya (UM) team developed a Sabah state-wide online questionnaire survey to understand people's behaviour, attitude and perception pertaining to marine plastic pollution and municipal solid waste management. Additionally, a citizen science programme with litter audit protocol is developed to identify geographical and systemic sources of mismanaged plastic waste in three identified litter hotspots within the Tun Mustapha Park. The understanding of key human factors for plastic pollution and patterns of land-based plastic pollution will enable the development of tailored intervention strategies to be pilot-tested in the Tun Mustapha Park.

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### **Profile**

A recent PhD graduate with over nine years' experience in marine research and conservation of marine ecosystems, Dr Kuit is dedicated towards marine conservation in Malaysia. She is passionate about sharing her passion for the marine environment.

# From Telemetry Drifter to Incinerator Vessel: A Review of Recent Technology Development to Monitor and Clean-up Marine Debris on the Coasts and Small Islands of Indonesia



Dr Rinny Rahmania  
Ministry of Marine Affairs and Fisheries (MMAF), Indonesia

## Abstract

The surge of plastic waste is considered a serious threat to ocean and coastal ecosystems, including towards marine biota conservation, which will subsequently endanger human health. Floating plastic wastes and other types of Marine Debris (MD) in our ocean may originate from unmanaged waste islands (from urban to rural area) and from fishing, shipping and passenger vessel activities which would then spread further from its origin and transboundary. For a vast archipelago such as Indonesia which has a unique oceanography condition, it is difficult to determine the source and affected areas of MD, since major cities which are assumed as hotspots of unmanaged waste, are mostly located in coastal areas and high activity of captured fisheries are scattered across Indonesia. Besides, there are hundreds of small islands which have limited capacity to manage their own wastes. Therefore, the Government of Indonesia recognises the importance of seasonal marine debris pattern research in monitoring and forecasting the dispersion pattern of MD within Indonesian waters and its surroundings in near real time. This enables the development of an appropriate solution and strategy to clean-up MD as targeted in the Presidential Regulation No 83, 2018.

In 2020, The Ministry of Marine Affairs and Fisheries (MMAF) of Indonesia developed a satellite-based tracking system and model and released more than 20 tracking drifters on three selected river mouths of Cisadane, Bengawan Solo (Java Island) and Musi (Sumatra Island) as well as drifter particles in major rivers in Indonesia. The results indicated that marine debris are drifted by wind and currents which are subsequently stranded in other places. The developed simulation model can forecast the time and location where the marine debris are expected to traverse and to be stranded in each season. This data is very important to generate the baseline information of marine debris movement, which is useful for the Indonesian government at the national or provincial in order to improve the mitigation effort, establish a better coordinative action plan and encourage further marine debris research in Indonesia. As a follow-up of this study, the MMAF also designed a concept of Debris Incinerator Vessel which will accelerate the clean-up MD effort in the affected coasts and small islands seasonally, also assisting local governments to manage domestic waste on a high-density, small island on a regular basis.

Keywords: coastal city, debris incinerator vessel, drifter, marine debris, small island

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## Profile

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Designation: Researcher since April 1st, 2006

Domain: Remote sensing, mangrove ecology, marine debris & coastal zone management

Affiliation: Ministry of Marine Affairs and Fisheries (MMAF), Republic of Indonesia

Department: Marine Research Center (<http://pusriskel.litbang.kkp.go.id/>)



Professor Dr Thamarat Koottatep  
Asian Institute of Technology (AIT), Thailand

### Abstract

There is now an increasing global awareness of the potential of the marine territories, the sustainable economic and social development strategy of marine environment and coastal areas. With the high economic growth of coastal cities, it is necessary to guarantee marine environmental protection and management programmes of terrestrial environments should be emphasised. Coastal tourism is becoming a big part of the economy, bringing in substantial income. Whilst this is a welcome aspect of coastal city development, it also brings critical impacts, bringing drawbacks to coastal cities.

Tourism activities generate many tonnes of solid wastes. Recent data has shown that plastic wastes represent 12 percent of generated wastes in coastal cities. Through the mismanagement of solid wastes, land-based plastic wastes are directly disposed into the sea. In order to prevent the wastes on land from reaching the marine environment, it is important to fortify plastic waste management as a crucial factor in the protection and development of coastal cities. Technologies and innovations such as novel collection systems, recycling and upcycling technologies, as well as promising wastewater treatment processes are a considerable and significant part for sustainable coastal city managements. This presentation will describe how to integrate those aforementioned technologies and innovations for the waste management chains.

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### Profile

Thammarat Koottatep is Professor of Environmental Engineering and Management of the Asian Institute of Technology (AIT), Thailand. He is an internationally recognised authority on wastewater treatment technology and management. His major scholarly contributions include publications of more than 60 referred international journal papers, 4 books, and 12 book chapters. He has over twenty Thai patents to his credit and several more pending. He has mentored more than 16 doctoral students.

He jointly developed a one-year Master's degree programme in 'Marine Plastics Abatement and Regenerative Sanitation'. Over the years, Professor Dr Koottatep has secured a significant number of funded projects including, research and training grants, and most notably, the Bill & Belinda Gates Foundation grants on Decentralised Wastewater Management in Developing Countries: Design, Operation and Monitoring.

He has contributed significantly to capacity building in wastewater management in Thailand and abroad, including capacity strengthening for policy makers. In 2015, Professor Koottatep won the AIT Research Leader Award on the basis of his innovative and practical approach to research, focus, and ability to carry out large-scale research projects.



Associate Professor Dr Matthew Tan  
Asia of Assentoft Aqua Asia Pte Ltd., Singapore

### Abstract

In the light of the 4th Industrial Revolution, there has been a rapid acceleration in innovation and the use of technologies. New ways of serving existing farmers' needs have surfaced and this has significantly disrupted existing best practices and the conventional aquaculture operations. A key trend is the development of technology that uses minimal manpower and can substantially protect and improve harvest yield using the same plot ratio of land and resources. This is important to the aquaculture industry as the industry has been badly hit by diseases outbreaks the past number of years.

Recent studies in Davos opined that robots and automation would take over more than 5 million jobs over the next five years. Farm workers looking to retain or attain employment over the next few years will be competing with machines for jobs. Coupled with the projected global population growth and a rather stunted job market, jobs competition will become extremely stiff. It is also noted that a significant share of the global workforce remains employed in aquaculture and the fishery sectors. With the looming forecast by many studies that our Ocean will be depleted by 2048, aquaculture is set to be the next biggest player in the production of food-fish. As a result, the use of robots and technology in aquaculture production will take centre-stage and this is already happening in many farms in Asia where automated Recirculating Aquaculture System is taking prominence.

Furthermore, the impact of the recent Coronavirus pandemic has grossly exposed the weaknesses and missing links in the Aquaculture supply chain and will most definitely and substantially cut into the worldwide production numbers.

Urban Aquaculture technology is set to fill this gap, but it has to be self-sustaining, using minimal manpower, and is energy efficient, deploying end-to-end farming strategy and is also commercially viable, bio secure and urban- friendly with small footprint.

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### Profile

Associate Professor Matthew Tan is currently the Chief Executive Officer, Asia of Assentoft Aqua Asia Pte Ltd.

Assentoft Aqua A/S (Denmark) is currently one of the world's leading Aquaculture Engineering (RAS) companies. The team at Assentoft Aqua has been involved in RAS development since the very beginning of the recirculation aquaculture industry, thus learning from both successes and failures from existing plants - including salmon plants. During this time, more than 200 plants ranging from production capacities of 10 tons/year to 2,000 tons/year per module have been delivered.

Assentoft is at the forefront of RAS research and development and today, it is second to none in having the lowest possible footprint RAS that saves space, pipes and rapid installation time by using steel tanks as their basic component. It has the best available water treatment within the industry, low investment per produced ton of fish and in-depth knowledge on salmon, trout and tropical pelagic fish production in land-based RAS-systems.

Prior to joining Assentoft, A/Prof Tan was the Chief Executive Officer and Director of Oceanus Tech Pte Ltd, which is a wholly-owned subsidiary of Oceanus Group Ltd, one of the world's largest land-based aquaculture company listed on the main board of the Singapore Stock Exchange. He also previously served as the Chief Technology Officer of the holding company. During his seven-year stint with the Oceanus group, he was responsible for the development of the company's risk management framework and its farms' operational protocols. He also oversaw the development and implementation of the company farm's bio-security plan which includes the validation & adoption of sustainable technologies, development & implementation of water monitoring system, animal nutrition & feed formulation and the use of Recirculating Aquaculture technologies in their farms (42 farms with 40,000 breeding tanks which is spread over 300km of coastal land and a 5,000-sea cage floating farm).

Prior to joining the Oceanus Group, A/Prof Tan was previously the CEO of an environmental engineering company where he served for more than 10 years. He has been involved in the extensive implementation of engineering solutions to the aquaculture and agriculture industry in both Singapore and Asia. He has a vision of developing evidence-based science and technology that is both ECO friendly and sustainable. In the past 15 years, he has been extensively involved in application development for the aquaculture industry and has successfully developed a set of land-based RAS protocols for the sustainable farming of food-fish in Singapore and Asia.

He currently holds the joint appointment as Singapore Representative (Private Sector) to APEC Policy Partnership on Food Security and is the Co-Chair for Sustainable Development in Agricultural and Fishery sectors where he coordinates discussions between senior officials, APEC governments and the private sector on the use of technology and combined resources for Sustainable Development in the Agriculture and Fishery Sectors.

Associate Professor Dr Tan is also involved in assisting governments with their Economic Transformation - Aquaculture 4.0 in the light of food security.

He is a graduate of SEAFDEC (Southeast Asian Fisheries Development Centre), Asia's leading fishery institution, where he received training under the Government of Japan Trust Fund Programme in hatchery and grow-out, sea weed and Benthic Diatom culture and production. On the academic front, Associate Professor Tan serves as an Adjunct Senior Research Fellow and Associate Professor (Aquaculture) at the Centre for Sustainable Tropical Fisheries and Aquaculture (CSTFA), College of Science and Engineering, James Cook University, Australia. James Cook University specialises in the sustainable exploitation of tropical aquatic species and is Australia's leading university in Tropical Fisheries Science. Through the Centre for Sustainable Tropical Fisheries and Aquaculture (CSTFA), JCU partners with the industry, NGOs, and the government to tackle crucial challenges associated with the sustainable production of seafood.



## Closing ceremony

### Guest of Honor



Professor Datuk Dr Asma binti Ismail  
Akademi Sains Malaysia (ASM)

### Closing Speech

Yang Berbahagia Professor Datuk Ir Ts Dr Siti Hamisah Tapsir

Group Chief Executive Officer & Vice-Chancellor of UCSI University

Yang Berbahagia Emerita Professor Dr Phang Siew Moi Fasc

Deputy Vice-Chancellor (Research & Postgraduate) of UCSI University

Yang Berbahagia Professor Dato' Dr Ahmad Ibrahim Fasc

Senate Member of UCSI University & Advisory Board Member of APEC Symposium 2021

Yang Berusaha Associate Professor Dr Eric Chan Wei Chiang

Chairperson of APEC Symposium 2021

Delegates from APEC member economies, moderators, panellists and participants of the symposium

Distinguished guests

Ladies and gentlemen

Assalamualaikum w.b.t and a very good afternoon.

I am very honoured to be here today, representing the Academy of Sciences Malaysia (ASM) to witness the launching of Asia-Pacific Economic Cooperation (APEC) Sustainable Coastal Cities Research Consortium and deliver closing address at this APEC Sustainable Coastal Cities Symposium organised by UCSI University in collaboration with APEC and the strategic partners.

Firstly, I would like to thank UCSI for inviting ASM to collaborate in organising this symposium that is significant to Malaysia and most of the APEC economies and countries in the global towards addressing the rising challenges pertaining to coastal cities such as coastal erosion, rising sea levels and marine debris.

It is gratifying to see both key players and scientific community from the global and Malaysia gathered in this 3-day symposium that is organised from 24 November until today to discuss on the possible solutions as well as scientific and policy interventions that could help address the coastal cities issues. I am happy to hear that over than 200 participants from 16 countries including Malaysia and APEC economies are participating in this symposium and hope all you have benefited from various sessions that were organised.

Coastal regions represent 20% of earth's total surface and a large portion of the total urban population lives in the major cities located in these regions. Ports and the related economic activities such as shipping, maritime transporting, tourism, fishing, and aquaculture are among the key activities that depend on coasts and work as a point of attraction for large numbers of workers and the population. These characteristics offer coastal communities with a lot of advantages, based on the coast's ecological, economic, scientific, and aesthetic values.

Being linked to the ocean that offers diverse economic and social benefits, the ocean economy is estimated at between USD 3-6 trillion per year, which is around 5% of the global Gross domestic product (GDP). Fisheries and aquaculture itself contributed to USD 100 billion per year and about 260 million jobs to the global economy.

However, beyond the positives, there is a growing concern on the sustainability of coastal cities. Humans derive many tangible and intangible benefits from coastal areas, resulted to the growing of human and environmental pressures in coastal areas which lead to significant impacts on coastal systems that requiring urgent attention in many coastal areas globally. Among others is marine debris where currently 8 million tonnes of discarded plastic are dumped into our oceans each year and this figure is projected to double by 2030. The proportion of plastic waste that are mismanaged in Southeast Asian economies itself including Malaysia is over than 75%. Strategic and concerted efforts in all nations are required to address these sustainability challenges of coastal cities.

As a 'Thought Leader' in science, technology and innovation (STI),ASM strives to foster a culture of excellence in science, engineering and technology in Malaysia. By virtue of our experts and the global networks, ASM is well-positioned and passionate about putting forward new ideas on leveraging STI for economic advancement, societal well-being and environmental sustainability as well as forging new growth sources through our strategic studies, initiatives and partnerships.

ASM leverages the knowledge and expertise of its 852 expert network members from 8 different disciplines including social science to connect meaningfully, create impact and deliver value to society and humanity. I am delighted to inform here, this is something that ASM would like to offer in terms of working together to take the relevant initiatives forward in the APEC region.

The efforts done through this APEC Sustainable Coastal Cities Symposium and APEC Sustainable Coastal Cities Research Consortium are much aligned with ASM's interest and efforts. ASM has implemented many strategic studies related to sustainability science which also include studies related to environmental sustainability. Among others is Water Sector Studies which has now brought to our partnership with Economic Planning Unit for the development of Water Sector Transformation 2040 (WST2040) Roadmap. ASM also entrusted by the Ministry of Environment and Water to perform Study on Strengthening of Environmental Governance (SEG) in Malaysia.

Recently, ASM has put together findings and recommendations from several our flagship studies related to zoonosis, precision biodiversity and Science Outlook 2020 for the proposed national efforts on "Planetary Health" that is vital to be mainstreamed in all national policies and plans through a whole-of-nation approach to address ecosystems, biodiversity, health and climate change in Malaysia for sustainable development. ASM believes cooperation and collaboration among all key players and stakeholders are important in ensuring a well-coordinated and concerted effort towards addressing issues and challenges of "Planetary Health" in Malaysia. Coastal and maritime are of course among the areas covered in this initiative.

Impact on nature is a component that is often neglected in economic development and social well-being. Many are unaware that human health is closely linked to biodiversity conditions and climate change. The COVID-19 pandemic which is one of the zoonotic diseases has resulted in 4.1 million deaths in the world and 90 million people fell to hardcore poverty by 2020. This reminds the world the importance of nature conservation and preservation and the need to balance them with socio-economic development.

Human civilisation has prospered through the unsustainable exploitation of natural resources, but we are now facing the risk of serious health effects due to the depreciation of natural support systems. Therefore, the adoption of a new "Planetary Health" approach that focuses on the interdependence between human, animal and environmental health is required. This approach is also vital in addressing issues pertaining to the sustainability of coastal cities as highlighted earlier.

The necessary action needs to be taken to address the gaps in the respective economies' "Planetary Health" ecosystem by providing appropriate infrastructure to prevent, reduce and manage the degradation of natural resources as well as emerging and re-emerging zoonotic diseases. It is important for the technology drivers outlined in the 10-10 Malaysia Science, Technology, Innovation and Economy Framework (10-10 MySTIE) to be fully utilised to address issues related to "Planetary Health", find new solutions and also to prepare for future pandemics.

Malaysia has adopted the 10-10 MySTIE Framework under the 12th Malaysia Plan for an integrated approach to address social-economic drivers. One of the socio-economic drivers is environment and biodiversity which is very much related to coastal cities. Through the 10-10 MySTIE Framework, it is hoped that S&T drivers in the form of emerging technologies such as AI, blockchain and sensor technology can be applied effectively for the assessment, monitoring and conservation of nature to enable planetary health. This is another area where we are hoping to work with relevant partners in APEC for a more sustainable region.

This APEC Sustainable Coastal Cities Symposium provides a platform for key players and scientific community among the APEC economies to discuss on the technologies and policies that are necessary for the preservation and sustainability of coastal cities, particularly to address the problem of plastic pollution in the East Asia and Pacific region which currently a major contributor of marine debris in the world.

Throughout 3 days of this symposium, I was made to understand that 6 panel discussions were successfully organised which cover discussion on the issues and challenges of marine debris, best practices and role of non-governmental, community engagement & public-private partnership in addressing marine debris as well as technology and innovation for the sustainable coastal cities.

All inputs and recommendations gathered from this symposium will be included in a white paper to APEC on effective policies that would resolve sustainability challenges of coastal cities, promote Industrial Revolution 4.0 (IR 4.0) digital supply chain management of plastics, and address trans-boundary issues.

In addressing matters pertaining to the sustainability of coastal cities, it cannot be done alone. All key players and scientific community need to work together in implementing strategic concerted efforts for better and more efficient solutions.

In relation to this, the APEC Sustainable Coastal Cities Research Consortium launched just now aims to bring together academic representative among the APEC economies and selected non-member economies to realize self-supporting coastal cities that are able to adapt to climate change, manage sea-level rise and support important marine ecosystems through collaboration in research. This consortium provides a platform for engagement among the national and international research partners in generating knowledge to empower coastal communities in addressing local challenges to sustainability.

This consortium will also look into the capacity building and awareness activities with coastal communities as well as policy recommendations to protect marine ecosystems and coastlines and to mitigate climate change.

I hope this symposium have benefitted all of you and the recommendations could help not only Malaysia and APEC economies but also other countries in the world towards addressing challenges pertaining to coastal cities and marine debris.

Once again, I would like to thank UCSI for inviting ASM to collaborate in organising this symposium. I also would like to take this opportunity to thank all of you for participating and contributing to this symposium.

With that, thank you. Wabillahitaufik walhidayah wassalammualaikum Warahmatullahi Wabarakatuh.

## Profile

Asma earned her BSc in Biology from the University of Nevada, Reno. She then received her MSc in Microbiology from Indiana University, Bloomington and a Ph.D specialising in cellular and molecular biology from the University of Nevada, Reno.

Asma started her career as a lecturer at the Department of Medical Microbiology and Parasitology, School of Medical Sciences, University of Science Malaysia in 1986. In 1989, she was appointed Visiting Scientist at Tokyo University and Visitor Fellow at Medical College, St Bartholomew Hospital in London in 1992. In 1993, she was promoted to Associate Professor and served as Deputy Dean of Administration in 1994. She was promoted to full professor in 2000 and was appointed Deputy Dean of Research.

During her tenure at USM, she has held numerous positions including Director of Center for Innovation and Technology Development, USM (2001); Founder Director, Molecular Medicine Research Institute (INFORM) (2003) and is the first woman in USM to hold the position of Deputy Vice-Chancellor (Research and Innovation).

Asma later became a Director-General of Higher Education at the Higher Education Ministry of Malaysia. She is presently the President of Academy of Sciences Malaysia and is the first female president of the academy. Her latest appointment was as the Chairperson of the Malaysian Qualifications Agency (MQA) starting from 1st Jan 2019 until 31st Dec 2021.



Associate Professor Dr Eric Chan Wei Chiang  
UCSI University, Malaysia

### About the Research Consortium

Coastal regions represent 20% of the earth's total surface, housing the majority of its urban population in major coastal cities. Over half of the global human population live in the coastal zone and this is increasing due to rapid urbanisation. It is estimated that 70 percent of the world's most populated cities are in the coastal zone. Prized for the aesthetic value, coastal cities are hubs for commerce, tourism, fishing, and aquaculture. Nonetheless, coastal cities face increasing pressure because of their large population load, the effects of climate change and sea-level rise. Indeed, sinking cities are a reality.

UCSI University's APEC Sustainable Coastal Cities Research Consortium's vision is to realise self-supporting coastal cities that are able to adapt to climate change, manage sea-level rise and support important marine ecosystems. This would be achieved by engaging national and international research partners in generating knowledge that would empower coastal communities to address local challenges to sustainability.

This is a long-term goal which cannot be achieved by any single agency. We are therefore fortunate to have with us strategic partners from:

1. Advanced Membrane Technology Research Centre, Universiti Teknologi Malaysia
2. Centre for Marine and Coastal Studies, Universiti Sains Malaysia
3. Institute of Oceanography and Environment, Universiti Malaysia Terengganu
4. Prince of Songkla University, Thailand
5. School of Strategic and Global Studies, Universitas Indonesia

Our research consortium will continue the discussions on sustainable coastal cities, build relationships that foster collaboration leading to impactful research and empower coastal communities. We are committed to promoting the concept of sustainable coastal cities and would like to invite all interested parties to join us in this endeavor.

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### Profile

Dr Eric Chan Wei Chiang is an Associate Professor of the Faculty of Applied Sciences, UCSI University, Kuala Lumpur, Malaysia and the Project Overseer of OFWG 10 2020A, APEC Sustainable Coastal Cities Symposium. He obtained his Ph.D. (Natural Product Chemistry) from Monash University and is a life-member in the International Society for Mangrove Ecosystems (ISME), Malaysian Society of Marine Sciences (MSMS) and Monash University Chapter of the Golden Key International Honour Society. He is also a member of the American Chemical Society, Medicinal Chemistry Division and has published over 72 publications with over 2026 citation and a h-index of 21.

He is ranked among the Top 2% Scientists in the World by the 2019 and 2020 Stanford University Report in the subfields of Pharmacology and Pharmacy. His work in green chemistry has won him several awards including the Top 5 Finalists of the Elsevier Green and Sustainable Chemistry Challenge 2015 and a Gold Medal for the Materials category in International Invention, Innovation and Technology Exhibition (ITEX 2020). His current research interest includes bioprospecting, waste conversion technologies and green chemistry.