



# INTERNATIONAL CONFERENCE

On Marine Litter Prevention and Sustainable Practices  
Towards a Circular Economy

## MARLISPACE 2026

March 6 - 7, 2026 at Nha Trang University, Viet Nam



Supported by



Federal Ministry  
for the Environment, Climate Action,  
Nature Conservation and Nuclear Safety



2021  
2030

United Nations Decade  
of Ocean Science  
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# INTRODUCTION

## About MARLISPACE 2026

Marine litter, especially plastic waste, has become one of the most pressing environmental challenges for coastal and marine ecosystems. With increasing attention to sustainable development and circular economy, there is an urgent need for international collaboration to share experiences, innovative practices, and effective policies to prevent marine litter and promote sustainable use of ocean resources. In this context, Nha Trang University in collaboration with Ostfalia University of Applied Sciences (Germany) will organize the International Conference on Marine Litter Prevention and Sustainable Practices towards a Circular Economy - MARLISPACE 2026.



The conference aims to:

Provide an academic forum for scientists, researchers, policymakers, and practitioners worldwide to present their latest findings on marine litter prevention and circular economy approaches.

Strengthen research and educational cooperation between universities and institutions in Vietnam and abroad.

Showcase the results of the REVFIN Project and promote joint initiatives among institutions and organizations interested in marine economy.

Exhibitions of research results and innovative products in recycling, fisheries, aquaculture.

University-Business signing of MOUs

## MARLISPACE 2026 – WELCOMING ADDRESS



**Dr. Quach Hoai Nam**  
President, Nha Trang University

Distinguished delegates, experts, and honored guests,

On behalf of the leadership of Nha Trang University, I would like to extend my warmest and most sincere welcome to all delegates who have come to the beautiful coastal city of Nha Trang to attend the International Conference on Marine Litter Prevention and Sustainable Practices towards a Circular Economy - MARLISPACE 2026.

Nha Trang University is deeply honored to be the host institution, co-organizing this international scientific event with Ostfalia University of Applied Sciences (Germany) and our partners. This conference is held within the framework of the project “Prevention, Reduction and Recycling of Fishnet pollution in Vietnamese Coastal Waters” - one of the largest and most prestigious international projects that Nha Trang University has implemented recently. Therefore, we have devoted great effort and strong commitment to organizing this conference. Our ambition goes beyond a conventional project wrap-up workshop. We aim to transform MARLISPACE 2026 into a platform for experts, scientists, policymakers, businesses, and communities to exchange knowledge, ideas, and practical solutions to one of the most pressing challenges of our time.

Located in the heart of Vietnam's South-Central Coast, Nha Trang University is not only a multidisciplinary educational institution with a rich tradition in the region but also an entity deeply connected to the ocean. We are profoundly aware of our mission to protect the ecosystems that sustain us, and to fulfill this mission, there is no other path forward than pioneering in sustainable development and promoting a circular economy. We recognize that addressing the plastic waste crisis requires urgent international collaboration to share experiences, innovative practices, and effective policies.



The themes of this conference comprehensively address key issues we need to understand and tackle, including the analysis and evaluation of policies and regulations on marine plastic pollution, the development of sustainable solutions in fisheries and aquaculture, effective management of marine debris and fishing gear within a circular economy framework, and the enhancement of public awareness.

Today's conference becomes even more meaningful as it builds upon the remarkable achievements of the REVFIN project. At Nha Trang University, we are incredibly thrilled by the practical impacts this project has brought about. Together with our project partners, we have deployed numerous activities, ranging from professional training for lecturers and students to communication and capacity-building for management officials and fishing communities. The university has also pioneered integrating new modules from the project, such as “Recycling Fishing Nets and Gears” and “Plastic Waste Management”, into our formal curriculum. The REVFIN Recycling Technology Demonstration Center at our university has hosted many knowledge-sharing and practical recycling activities. On this occasion, Nha Trang University deeply appreciates the support of the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (Germany), Ostfalia University of Applied Sciences, along with partners including universities and businesses in Vietnam. We strongly believe that this solid foundation will open up extensive collaborative opportunities, helping us to continue sustainably implementing marine environmental protection initiatives in the future.

Through this conference, Nha Trang University desires to establish strategic, comprehensive, and sustainable partnerships with universities, international organizations, and individual experts. We highly value your cooperation in training high-quality human resources, strengthening knowledge exchange, and especially engineering sustainable solutions for the marine environment. I hope that with knowledge and relentless efforts, together, we can contribute our part to conserving the seas and oceans for future generations.

I hope all delegates gain positive scientific value, forge breakthrough connections, and have unforgettable moments discovering Vietnamese culture. May you thoroughly enjoy the fresh sea breeze and the unique beauty of Nha Trang – a city of sincerity and hospitality.

Once again, a warm welcome to Nha Trang University.

Wishing all of you health and happiness.

Wishing the MARLISPACE 2026 conference resounding success.

Thank you very much.

## ORIGANIZING COMMITTEE

<b>Prof. Dr. Pham Quoc Hung</b>	Nha Trang University	Chairman
<b>Prof. Dr. Trang Si Trung</b>	Nha Trang University	Vice Chairman
<b>Dr. Quach Hoai Nam</b>	Nha Trang University	Member
<b>Dr. Khong Trung Thang</b>	Nha Trang University	Member
<b>Dr. Tran Doan Hung</b>	Nha Trang University	Member
<b>Assoc. Prof. Dr. Nguyen The Han</b>	Nha Trang University	Member
<b>Dr. Vu Ke Nghiep</b>	Nha Trang University	Member
<b>Assoc. Prof. Dr. Tran Hung Tra</b>	Nha Trang University	Member
<b>MSc. Nguyen Van Han</b>	Nha Trang University	Member
<b>MSc. Tran Minh Van</b>	Nha Trang University	Member
<b>MA. Pham Ngoc Bich</b>	Nha Trang University	Member
<b>MA. Vu Thi Luong</b>	Nha Trang University	Member
<b>MA. Luong Dinh Duy</b>	Nha Trang University	Member
<b>Dr. Nguyen Thi Ngan</b>	Nha Trang University	Member
<b>Prof. Dr. Max Ehleben</b>	Ostfalia University of Applied Sciences (Germany)	Member
<b>Dr. Nguyen Van Thanh</b>	Kien Giang University	Member
<b>Dr. Pham Thi Hue</b>	Ha Long University	Member



## SCIENTIFIC COMMITTEE

### Chairman

**Prof. Dr. Thomas Potempa**

Ostfalia University of Applied Sciences

**Prof. Dr. Trang Si Trung**

Nha Trang University

**Prof. Dr. Pham Quoc Hung**

Nha Trang University

**Prof. Dr. Max Patrick Ehleben**

Ostfalia University of Applied Sciences

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### Members

**Prof. Dr. Habil. Harald Rau**

Ostfalia University of Applied Sciences

**Assoc. Prof. Dr. Quach Thi Khanh Ngoc**

Nha Trang University

**Prof. Dr. Max Juraschek**

Ostfalia University of Applied Sciences

**Dr. Chu Luong Tri**

Ha Long University

**Assoc. Prof. Dr. Ruei-Feng Shiu**

National Taiwan Ocean University

**Assoc. Prof. Dr. Nguyen Trung Cang**

Kien Giang University

**Prof. Dr. Cheng-Di Dong**

National Kaohsiung University of Science and  
Technology

**Dr. Nguyen Van Nguyen**

Research Institute for Marine Fisheries

**Assoc. Prof. Dr Liu Xia**

Ocean University of China

**Mr. Tran Thanh Long**

Siam Brothers Vietnam Joint Stock Company

**Dr. Zuhao Zhu**

Fourth Institute of Oceanography of China

**Ms. Nguyen Thi Hai Binh**

STP Group

**Dr. Quach Hoai Nam**

Nha Trang University

**Dr. Khong Trung Thang**

Nha Trang University

**Dr. Tran Doan Hung**

Nha Trang University

**Assoc. Prof. Dr. Nguyen The Han**

Nha Trang University

**Assoc. Prof. Dr. Tran Hung Tra**

Nha Trang University

## KEYNOTE SPEAKERS



### **Prof. Dr. Habil. Harald Rau**

Topic: Societal Communication and the Circular Plastics Economy

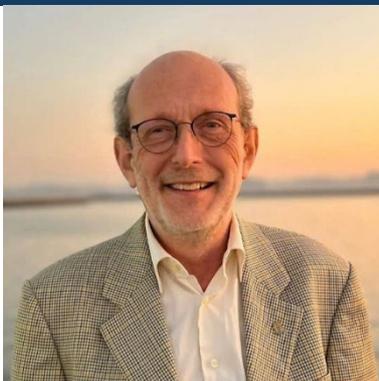
**Ostfalia University of Applied Sciences, Germany**



### **Prof. Dr. Max Patrick Ehleben**

Topic: Opportunities and Challenges of Plastic Recycling

**Ostfalia University of Applied Sciences, Germany**



### **Prof. Dr. Thomas Potempa**

Topic: Diversity and Individual Producer Responsibility

**Ostfalia University of Applied Sciences, Germany**



### **Prof. Dr. Pham Quoc Hung**

Topic: Featuring and promoting the REVFIN project

**Nha Trang University, Viet Nam**

## CONFERENCE AGENDA

Time	Agenda
<b>Day 1 — March 6, 2026</b>	
08:00 - 09:00	<b>Registration</b>
09:00 - 09:30	<b>Opening Ceremony</b> <ul style="list-style-type: none"> <li>- Music performances by NTU students</li> <li>- Opening speeches by:               <ul style="list-style-type: none"> <li>• Dr. Quach Hoai Nam (President, Nha Trang University)</li> <li>• Prof. Max Ehleben (Project Leader, Ostfalia University of Applied Sciences)</li> <li>• Mr. Jens Schmid-Kreye (Representative, German Embassy in Hanoi)</li> <li>• Mr. Nicholas Marquardt (Representative, ZUG: Funding Provider)</li> </ul> </li> </ul>
09:30 - 09:45	<b>Honorary doctorate ceremony</b>
09:45 - 10:00	<b>Keynote 1:</b> Featuring and promoting the REVFIN project – <i>Prof. Pham Quoc Hung (Chair: Prof. Max Ehleben)</i>
10:00 - 10:10	Short video about the REVFIN project and its protagonists – <i>M.A. Alena Mychkova</i>
10:10 - 10:30	Tea Break
10:30 - 11:00	<b>Keynote 2:</b> Successful societal communication - challenges for the circular economy – <i>Prof. Harald Rau (Chair: Prof. Trang Si Trung)</i>
11:00 - 11:30	<b>Keynote 3:</b> Opportunities and challenges of plastic recycling – <i>Prof. Max Ehleben (Chair: Assoc. Prof. Nguyen Trung Cang)</i>
11:30 - 12:00	Documentary film on the REVFIN project - highlights, objectives, outcomes – <i>M.A. Alena Mychkova</i>
12:00 - 13:00	Lunch
13:00 - 14:15	Parallel Session 1 <ul style="list-style-type: none"> <li>- <i>Strand 1: 3 presentations</i></li> <li>- <i>Strand 2: 3 presentations</i></li> <li>- <i>Strand 3: 3 presentations</i></li> <li>- <i>Strand 4: 3 presentations</i></li> </ul>
14:15 - 15:15	Demo Center Visit Tea Break Poster Session
15:15 - 16:30	<b>Panel Discussion</b> ( <i>Moderator: Dr. Nguyen Thi Ngan</i> ) <ul style="list-style-type: none"> <li>- <i>Topics: reduction and recycling of fishing gears (special issues/ questions) awareness and governance</i></li> <li>- <i>Representatives from policy maker, industry, local and central authorities, and scientist</i></li> </ul>
18:00 - 21:00	<b>Gala Dinner</b>



<b>Day 2 — March 7, 2026</b>	
08:00 - 09:00	<b>Registration</b>
09:00 - 09:30	<b>Keynote 4:</b> Diversity and individual producer responsibility – <i>Prof. Thomas Potempa (Chair: Dr. Tran Doan Hung)</i>
09:30 - 09:40	A Green Journey - <i>Mr. Tran Thanh Long, Vice Director - Siam Brothers Vietnam Jont Stock Company</i>
09:40 - 10:00	Experiences, impact and concrete on-location outcomes of the joint teaching and the train-the-trainer program – <i>Vietnamese Participants Trained in Germany (2 presentations)</i>
10:00 - 10:30	From curriculum to industry: shaping the skills of tomorrow's workforce - <i>Presentation from HLU</i> - <i>Presentation from NTU</i> - <i>Presentation from KGU</i>
10:30 - 11:00	Tea Break
11:00 - 12:00	Project partners in industry: Contributions, achievements, and next steps - <i>Vietnamese industry requirements to improve recycling process – STP/Siam Brothers</i> - <i>Open discussion</i>
12:00 - 13:30	Lunch
13:30 - 14:45	<b>Parallel Session 2</b> - <i>Strand 1: 3 presentations</i> - <i>Strand 2: 3 presentations</i> - <i>Strand 3: 3 presentations</i> - <i>Strand 4: 3 presentations</i>
14:45- 15:15	Tea Break
15:15- 16:30	<b>Parallel Session 2 (Cont.)</b> - <i>Strand 1: 3 presentations</i> - <i>Strand 2: 3 presentations</i> - <i>Strand 3: 2 presentations</i> - <i>Strand 4: 3 presentations</i>
<b>Day 3 — March 8, 2026: Fieldtrip for selected participants</b>	



**PARALLEL SESSIONS**

**DAY 1 – MARCH 6, 2026**

**13:00 – 14:15 | Parallel Session 1**

Time	<p><b>Strand 1 – Marine plastic pollution: state of the art processes, recycling policies and regulations</b></p> <p>✚ Room: H-01</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Assoc. Prof. Dr Liu Xia</b>, <i>Ocean University of China</i></li> <li>Chair 2: <b>Prof. Dr. Defri Yona</b>, <i>Universitas Brawijaya</i></li> </ul>	<p><b>Strand 2 – Fisheries and aquaculture: engineering sustainable solutions for plastic products</b></p> <p>✚ Room: G4-01</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Dr. Zuhao Zhu</b>, <i>Fourth Institute of Oceanography of China</i></li> <li>Chair 2: <b>Assoc. Prof. Rakesh Dhumale</b>, <i>All India Shri Shivaji Memorial Society's Institute of Information Technology</i></li> </ul>	<p><b>Strand 3 – Recycling and circular economy approaches: innovations in marine debris and fishing gear management</b></p> <p>✚ Room: G4-02</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Assoc. Prof. Tran Le Luu</b>, <i>Vietnamese German University</i></li> <li>Chair 2: <b>Prof. Dr. Chih-Chieh Young</b>, <i>National Taiwan Ocean University</i></li> </ul>	<p><b>Strand 4 – Plastics, environment and society: awareness, education and social engagement</b></p> <p>✚ Room: G4-03</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Prof. Dr. Pradeep V. Jadhav</b>, <i>Bharati Vidyapeeth's College of Engineering for Women</i></li> <li>Chair 2: <b>Assoc. Prof. Dr. Nguyen Trung Cang</b>, <i>Kien Giang University</i></li> </ul>
<p><b>13:00 – 13:25</b></p>	<p><b>S1-01.</b> Environmental processes of microplastics in marine environments — <b>Xia Liu, Jian Zhao</b></p>	<p><b>S2-01.</b> Artificial Intelligence based Monitoring and Early Detection of Plastic Waste in Fisheries — <b>R. B. Dhumale, M. A. Thalor, P. B. Mane</b></p>	<p><b>S3-01.</b> Plastic Waste Management in Karimunjawa Small Island Marine Protected Area: Fast Pyrolysis and Governance Integration — <b>Jubakti Anggoro, Arif Wahid Hidayat, Indah Susilowati</b></p>	<p><b>S4-01.</b> Marine plastic pollution: state of the art processes, recycling policies and regulations — <b>Nguyen Huu Ninh</b></p>



<p>13:25 – 13:50</p>	<p><b>S1-02.</b> Comparative Analysis of Sachet Waste Accumulation and Weathering Levels on Two Northern Coast Beaches of East Java: A Case Study of Kerapu Beach and Duta Beach — <b>Defri Yona, Teguh Ariefandi, Arini Puspa Ahatsy, Indri Asifah Putri, Syarifah Hikmah Julinda Sari</b></p>	<p><b>S2-02.</b> Bioplastic: Sustainable Engineering Solutions for Vietnamese Fisheries — <b>Bui Thi Phuong Thao</b></p>	<p><b>S3-02.</b> The Role of Life Cycle Engineering in the Design of Recycling Processes for Fishing Gear — <b>Max Juraschek</b></p>	<p><b>S4-02.</b> Innovating Sustainable Education with Recycled Plastics — <b>Pradeep V. Jadhav</b></p>
<p>13:50 – 14:15</p>	<p><b>S1-03.</b> Distribution and ecological risks of microplastics in sediments of Southern Vietnam — <b>Nguyen Thi Nhan, Dao Van Tri, Tran Le Luu</b></p>	<p><b>S2-03.</b> Reusing plastic in aquaculture to produce unc plastic bricks, contributing to environmental protection — <b>Pham Quoc Huy, Le Anh Thang, Pham Manh Dinh</b></p>	<p><b>S3-03.</b> Recyclability of HDPE Fishing Net under Different Environmental and Accelerated Aging Conditions — <b>Vu Khanh Ho, Ngoc Chien Vu, Cong Minh Nguyen, Thi Thu Thuy Diep, Robin Führmanne, Welf Graf von Luxburg-Marten, Julia Tetzner, Nguyen Van Nhi Tran, Thomas Potempa, Max Ehleben</b></p>	<p><b>S4-03.</b> Determinants of Fishermen's Plastic Marine Debris Collection in Southwestern Waters of Vietnam — <b>Nguyen Van An, Nguyen Huu Du, Duong Van Nha</b></p>



## DAY 2 – MARCH 7, 2026

### 13:30 – 17:35 | Parallel Session 2

Time	<p><b>Strand 1 – Marine plastic pollution: state of the art processes, recycling policies and regulations</b></p> <p>✚ Room: H-01</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Assoc. Prof. Dr. Kaire Torn</b>, <i>University of Tartu</i></li> <li>Chair 2: <b>Assoc. Prof. Dr. Ying-Ning Ho</b>, <i>National Taiwan Ocean University</i></li> </ul>	<p><b>Strand 2 – Fisheries and aquaculture: engineering sustainable solutions for plastic products</b></p> <p>✚ Room: G4-01</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Prof. Dr. Keliang Wang</b>, <i>Ocean University of China</i></li> <li>Chair 2: <b>Assoc. Prof. Dr. Quach Thi Khanh Ngoc</b>, <i>Nha Trang University</i></li> </ul>	<p><b>Strand 3 – Recycling and circular economy approaches: innovations in marine debris and fishing gear management</b></p> <p>✚ Room: G4-02</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Dr. Nguyen Doan Quyet</b>, <i>Nha Trang University</i></li> <li>Chair 2: <b>Prof. Dr. Anchan Prathep</b>, <i>Prince of Songkla University</i></li> </ul>	<p><b>Strand 4 – Plastics, environment and society: awareness, education and social engagement</b></p> <p>✚ Room: G4-03</p> <p>✚ Session Co-Chairs:</p> <ul style="list-style-type: none"> <li>Chair 1: <b>Prof. Dr. Alexander Kaufman</b>, <b>Global Standards (Asia)</b></li> <li>Chair 2: <b>Mrs. Bui Thi Thu Hien</b>, <i>IUCN – International Union for Conservation of Nature</i></li> </ul>
13:30 – 13:55	<p><b>S1-04.</b> Four years monitoring of microplastic in the Beibu Gulf, the Northern South China Sea — <b>Zuhao Zhu</b>, <i>Huihua Wei</i>, <i>Wenhao Houa</i>, <i>Changhao Sun</i>, <i>Shuting Panga</i></p>	<p><b>S2-04.</b> Innovative Lifecycle Carbon Accounting in Mariculture: Integrating Species Traits and Energy Transitions — <b>Keliang Wang</b></p>	<p><b>S3-04.</b> Recycling Pathways and Circular Economy Opportunities for Plastics from Fishing Gear — <b>Nguyen Van Nhi Tran</b>, <i>Thanh Thu Tran</i></p>	<p><b>S4-04.</b> Enhancing community awareness and behavioral change for plastic waste reduction in marine tourism development in Quảng Ninh Province — <b>L M T Nguyen</b></p>
13:55 – 14:20	<p><b>S1-05.</b> Preventing Marine Plastic Waste through Local Regulation and Coastal Community Participation in Semarang City, Indonesia — <b>Novia Mungawanah</b>, <i>Amiek Soemarmi</i>, <i>Indah Susilowati</i></p>	<p><b>S2-05.</b> PFAS contamination in aquaculture: Current evidence and research needs in Vietnam — <b>Dao Van Tri</b>, <i>Dang Ngoc Quan</i>, <i>Tran Le Luu</i></p>	<p><b>S3-05.</b> The role of local government in the integrated management of abandoned, lost, or discarded fishing gear in Vietnam — <b>Tuan Anh Bui</b>, <i>Thu Huyen Pham</i></p>	<p><b>S4-05.</b> Effectiveness of the Awareness-Raising Program on fishing gear Waste in Kien Giang — <b>Dang Thi Hong Ngoc</b>, <b>Do Ta Manh Tien</b>, <i>Ngo Thi Hieu</i></p>



<p><b>14:20</b> – <b>14:45</b></p>	<p><b>S1-06.</b> Implementing EU Marine Litter Monitoring Frameworks: Practical Experience from the NE Baltic Sea — <b>Kaire Torn, Tiia-Möller-Raid, Maria Pöldma</b></p>	<p><b>S2-06.</b> Inner and Outer Ageing of Polyethylene Fishing Nets Based on the Carbonyl Index — <b>Julia Tetzner, Thomas Potempa, Max Ehleben</b></p>	<p><b>S3-06.</b> Recycling and circular economy approaches: innovations in marine debris and fishing gear management — <b>Nguyen Van Nguyen, Phan Dang Liem, Do Van Thanh, Pham Sy Tan</b></p>	<p><b>S4-06.</b> Unlocking Coastal Potential: A KAP Analysis of Waste Management Interventions in Bandengan, Central Java — <b>Agnes Graciella Salianto, Aisyah Raisha Kamila, Indah Susilowati</b></p>
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**14:45 – 15:15: Tea break / transition time**

**15:15 – 16:55 | Parallel Session 2 (Cont.)**

Time	Strand 1 (Room: H-01)	Strand 2 (Room: G4-01)	Strand 3 (Room: G4-02)	Strand 4 (Room: G4-03)
<p><b>15:15</b> – <b>15:40</b></p>	<p><b>S1-07.</b> Plastic Debris Modulates the Partitioning of Emerging Contaminants in Marine Environmental Matrices — <b>Madeline Olivia, Ruei-Feng Shiu</b></p>	<p><b>S2-07.</b> Challenges in Plastic Waste Management in Industrial Marine Aquaculture in Vietnam — <b>Bui Thi Ninh</b></p>	<p><b>S3-07.</b> Development of Sustainable Materials from End-of-Life Fishing Nets in Vietnam via Optimization of Recycled and Virgin Material Blending Ratios — <b>Nguyen Thi Nghiem Thuy, Nhu D. Huynh, Nguyen Thi Mai Ly, Thanh Xuan Do, Quyet D. Nguyen, Van Ta-Do, Welf Graf von Luxburg-Marten, Julia Tetzner, Max Juraschek, Max Ehleben</b></p>	<p><b>S4-07.</b> Coastal Plastic Waste Management: An Empirical Study of Community Engagement and Awareness in Mangunharjo — <b>Afnira Eka Ramadanti, Indah Susilowati</b></p>



<p><b>15:40</b> – <b>16:05</b></p>	<p><b>S1-08.</b> From Plastics to Plastisphere: Multi-Omics Approaches Reveal Microbial Succession, Bioactive Cues, and Marine Organism Attraction — <b>Ying-Ning Ho, Chih-Hao Hsu, Po-Yuan Cheng, Yu-Ling Chen, Che-Chun Chen, Hsin-Yun Lu</b></p>	<p><b>S2-08.</b> Impact of Adoption of Preventive Measures to Avoid Losing Fishing Gear for Fishermen in Vietnam — <b>Quach Thi Khanh Ngoc, Alena Mychkova, Nguyen Thi Ngan</b></p>	<p><b>S1-08.</b> Plastic Occurrence in Seagrass Meadows and What We Are Working on? — <b>Fika Afriyani, Ekkalak Rattanachot, Anchana Prathep</b></p>	<p><b>S4-08.</b> Enhancing Livelihoods in Nha Trang: The Waste Pickers’ Role in Advancing Vietnam's Circular Economy Framework — <b>Alexander Kaufman, Doan Lam Ngoc, Huynh Ngoc Quynh Nhu, Ngo Phuong Linh</b></p>
<p><b>16:05</b> – <b>16:30</b></p>	<p><b>S1-09.</b> Quantifying Riverine Plastic Flux: A Cost-Effective Bridge-Based Computer Vision System for Velocity and Accumulation Analysis — <b>Ngo Anh Hieu</b></p>	<p><b>S2-09.</b> Potential for Integrating Fishing Gear Recycling into Carbon Credit Markets in Vietnam — <b>Nguyen Thi Tham, Dinh Quynh Oanh, Diep Thi Thu Thuy, Bui Thi Nha Trang, Kasumi Ito</b></p>		<p><b>S4-09.</b> From Evidence to Action: Citizen Science Insights on Macroplastic Pollution for Decision-Making — <b>Bui Thi Thu Hien, Nguyen Duc The, Chu The Cuong</b></p>

## POSTER SESSION

Poster exhibition area: Open space near Hall H-01

Poster mounting time: Throughout the conference (March 6–7, 2026)

Poster discussion time:

- Day 1 (March 6): 14:15 – 15:15

- Day 2 (March 7): 14:45 – 15:15

**P-01.** Microplastic pollution from raw water supply source: a case study in Southern Vietnam

*Nguyen Thi Nhan, Dao Van Tri, Tran Le Luu*

**P-02.** Increasing the recycling rates of post-use fishing ropes: the role of cleaning processes and the possibilities of a systematic individual-producer-responsibility implementation

*Vo Xuan Huyen*

**P-03.** Potential sustainable ingredient replacements for fish meal in shrimp feed

*Dinh Xuan Lap, Le Thi Phuong Dung, Bui Thi Huong, Nguyen Dac Tu*

**P-04.** Towards sustainable urban development: community satisfaction with public transportation in Khanh Hoa Province

*Huynh Cat Duyen, Nguyen Pham Bao Khanh, Nguyen Thi Tu Trinh*

**P-05.** Balancing economic and environmental motives in marine tourism waste management in Karimunjawa

*Nur Shafika*

**P-06.** Enhancing human resource quality through empowering stakeholders in sustainable tourism

*Nguyen Thao Phan*

**P-07.** Factors influencing the choice of green tourism aimed at reducing marine debris in An Giang

*Huynh Chi, Huynh Trung Bao*

**P-08.** Investigating awareness and engagement potential to reduce marine plastic sources

*Milena Thiel*

**P-09.** Collection and recycling of plastic waste from marine fisheries: international experiences and application potential in Vietnam

*Nguyen Phuoc Quy Tuong*

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# KEYNOTE SESSIONS

## SOCIETAL COMMUNICATION AND THE CIRCULAR PLASTICS ECONOMY



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### Abstract

This keynote conceptualises the transition to a circular plastics economy as a crisis of societal communication and orientation, rather than merely a technical or economic problem (Valenzuela & Böhm, 2017). Drawing on Habermas' theory of communicative action, it argues that contemporary plastics debates are best understood as struggles over how validity claims of truth, rightness and sincerity are raised, tested and institutionalised in public discourse (Habermas, 1984). The core thesis is that circular economy strategies will remain fragile, depoliticised or co-opted as long as public communication in this field is dominated by strategic rather than communicative action (Habermas, 1984; Valenzuela & Böhm, 2017).

The paper first reconstructs Habermas' distinction between communicative action—interaction oriented toward mutual understanding—and strategic action—interaction oriented toward influencing others for predefined goals (Habermas, 1984). It links this distinction to the plastics domain by showing how corporate sustainability reports, circular economy roadmaps of governments round the world, and NGO campaigns often employ language instrumentally, seeking legitimacy, compliance or behavioural change without opening underlying assumptions and trade-offs to genuine contestation (Schönbauer & Müller, 2021; Pop et al., 2023). This pattern is interpreted, following Habermas, as systematically distorted communication that undermines the orienting function of public discourse (Habermas, 1987).

Second, the keynote examines the role of media in shaping public understandings of plastics, risks and circular solutions. Research on media coverage of plastics and microplastics demonstrates that narrative framings significantly influence issue awareness and perceived risks, often independently of detailed scientific literacy (Schönbauer & Müller, 2021; Pop et al., 2023). Journalism in the circular economy is shown to operate under pressures that encourage reliance on institutional sources and pre-formatted circularity narratives, thereby increasing the likelihood that strategic frames are amplified rather than critically interrogated (Jóhannsdóttir et al., 2024).

Third, the paper analyses the ambivalent implications of disintermediation via social media. While classic mass media function as gatekeepers of national public spheres, social media platforms allow state and corporate actors, NGOs and citizens to address self-selected publics directly (Habermas, 1989; Eldridge, 2019). Fuchs (2014) argues that current platform logics—data

extraction, algorithmic optimisation for engagement and commodified visibility—colonise the digital lifeworld and favour episodic “clicktivism” over sustained deliberation. In the plastics context, social media have been crucial for exposing waste exports and mobilising support for single-use bans, yet they seldom provide stable conditions for inclusive, reason-giving discourse (Lazell & Alexander, 2025; Fuchs, 2014).

Building on these diagnostics, the keynote advances a normative–institutional argument for a deliberative approach to plastics and circular economy governance. It proposes that legitimate circularity pathways require discursive transparency of empirical and normative assumptions; inclusion of structurally affected actors, especially in waste-importing regions; and multi-scalar fora where competing strategies can be argued through under conditions that limit strategic manipulation (Risse, 2000; Ferronato et al., 2024). It further contends that media and platform reforms are needed to support investigative scrutiny and long-form reasoning, and that political, corporate and civil-society actors must become reflexive about their own communicative orientations (Fuchs, 2014; Habermas, 1984). The overall conclusion is that the fate of a circular plastics economy is deeply intertwined with the quality of societal communication: only where actors shift from managing perceptions to sharing reasons can circularity move beyond a technocratic or legitimising slogan toward a deliberatively grounded transformation.

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## OPPORTUNITIES AND CHALLENGES OF PLASTIC RECYCLING



**Prof. Dr. Max Patrick Ehleben**

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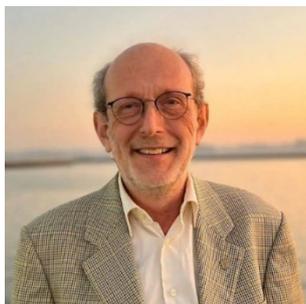
### Abstract:

The keynote speech addresses the key challenges and opportunities in recycling plastic fishing gear, which contributes significantly to marine pollution. As part of Net Experiments, the ageing behaviour of PE-HD nets was investigated under different environmental conditions, and it was found that despite slight signs of ageing in the polymer, there was practically no decline in the mechanical properties of the material. This indicates a high recycling potential.

A recycling process is described that includes collection, sorting, cleaning, shredding and extrusion. The main challenges include contamination, material heterogeneity and water-intensive cleaning. Innovative solutions such as sensor-based sorting, closed water cycles and the development of a new recycling process aim to avoid thermal recycling as far as possible and minimise water consumption.

Future research should focus on the practical implementation of a closed-loop recycling process for fishing gear, determining the useful lifetime for successful recycling and developing a simple-to-use rapid test for fishermen. This implementation process requires the collection of fishing nets, the manufacture of recycled nets, the conduct of field studies and the demonstration of economic feasibility. The project highlights the importance of international cooperation, political support and technological innovation in closing the loop and promoting a circular economy for fishing gear.

## DIVERSITY AND INDIVIDUAL PRODUCER RESPONSIBILITY



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**Abstract**

Plastic pollution is not a monolithic challenge—its complexity lies in the vast *diversity* of polymer types, additives, and end-of-life pathways. This heterogeneity undermines recycling efficiency and perpetuates contamination in waste streams. Yet, diversity, when strategically managed, can become a catalyst for innovation. By embracing the *diversity of plastics* not as a barrier but as a resource, we can design materials with traceability, compatibility, and recyclability in mind—laying the foundation for a truly circular system.

This keynote introduces *Individual Producer Responsibility (IPR)* as a transformative economic mechanism that aligns incentives across the value chain. Unlike traditional Extended Producer Responsibility (EPR), IPR assigns accountability to individual producers based on the environmental footprint of their specific products, encouraging design-for-recycling and material transparency. When producers are financially responsible for the entire lifecycle of their plastic goods, they are motivated to use high-quality, easily recyclable materials—reducing contamination and lowering collection and sorting costs.

Crucially, IPR enables the creation of *high-quality, low-cost raw materials* from post-consumer waste—essential for closing the loop. This model mirrors *production-integrated environmental protection*, but extends it into the consumer sphere: *Consumer Integrated Environmental Production*. Here, every consumer becomes a potential contributor to a sustainable system through responsible disposal, incentivized by transparent feedback and rewards. By merging material diversity with individual accountability, we move beyond waste management toward a proactive, inclusive, and economically viable circular economy—one where responsibility, innovation, and sustainability are embedded at every stage.



# STRAND 1

**Marine plastic pollution: State of the art processes, recycling policies and regulations**

## ENVIRONMENTAL PROCESSES OF MICROPLASTICS IN MARINE ENVIRONMENTS

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### Abstract

Plastic pollution emerged as one of the world's greatest environmental problems in marine environments. Plastic wastes would fragment into microplastics (MPs, < 5 mm) which require more attention than larger plastic debris, due to the higher number concentration and potential toxicity of MPs. Adsorption, aggregation and transport are key environmental processes governing the behavior of MPs in marine environments. We found that MPs could adsorb co-pollutant (e.g., per- and polyfluoroalkyl substances PFASs), with hydrophobic interaction governing the adsorption of PFASs on a given MP. As particulate pollutants, MPs inevitably undergo aggregation (particularly for heteroaggregation) in seawater. Heteroaggregation was observed between MPs and mineral particles (e.g., iron oxides and Al<sub>2</sub>O<sub>3</sub>), and electrostatic force played a key role in their heteroaggregation. Natural organic matter (NOM) inhibited MPs-minerals heteroaggregation due to the strong steric hindrance interaction. After heteroaggregation and settling, sediment becomes a sink of MPs. Therefore, transport of MPs with different functional groups and hydrophobicities in the marine sediments was further explored. Eco-corona could be formed on the surfaces of both MPs and sediment particles, and their role in the transport of MPs are identified. These findings provide valuable insights for predicting the fate and risk of MPs in marine environments.

## COMPARATIVE ANALYSIS OF SACHET WASTE ACCUMULATION AND WEATHERING LEVELS ON TWO NORTHERN COAST BEACHES OF EAST JAVA: A CASE STUDY OF KERAPU BEACH AND DUTA BEACH

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### Abstract

Sachets are defined as small, single-use plastic packaging composed of three layers of polymer materials. Sachet waste is one of the most dominant types of plastic debris found in Indonesian coastal ecosystems and poses a significant threat to marine environmental health. This study aims to analyse the accumulation characteristics and weathering levels of sachet waste on two beaches with contrasting environmental conditions: Kerapu Beach in Situbondo Regency and Duta Beach in Probolinggo Regency. Kerapu Beach is a narrow and less-visited coastline with mangrove stands that potentially trap marine debris, while Duta Beach is a popular tourist destination. The field survey was conducted in August 2025, and sachet samples were collected from the foreshore zone to ensure representation of long-term accumulation. A transect of at least 100 meters was applied, with the width following the local tidal range. All sachets found were counted, categorized (food, beverages, household products, health, beauty, and others), assessed for weathering level (fresh, light, moderate, and heavy), and quantified for their abundance. The results show clear differences in sachet characteristics between the two study sites. At Kerapu Beach, sachet composition was dominated by beverages (50%), food products (40%), and household cleaning items (10%), whereas Duta Beach was dominated by food packaging (58%), beverages (25%), and household cleaning products (17%). Weathering analysis indicated variations in residence time. Kerapu Beach exhibited a higher proportion of moderately weathered (50%) and lightly weathered (30%) sachets, suggesting longer-term accumulation driven by marine debris transported and retained within the mangrove system. In contrast, Duta Beach showed a high proportion of fresh sachets (42%) with more variable weathering stages, reflecting continuous inputs from tourism activities. In terms of total weight, sachet debris at Duta Beach was lighter (8.39 g) compared to Kerapu Beach (27.9 g). These findings indicate distinct accumulation mechanisms: Kerapu Beach primarily receives marine-origin debris trapped by mangroves, while Duta Beach receives direct land-based inputs from visitors. The contrasting physical characteristics of the beaches and differences in human activity appear to influence the accumulation and degradation patterns of sachet waste, providing important implications for site-specific mitigation strategies.

**Keywords:** *plastic, weathering level, foreshore zone, mangrove, tourist beach*

## MICROPLASTIC ACCUMULATION IN OYSTER (*Magallana Belcheri*) COLLECTED FROM THE MANGROVE ECOSYSTEM OF CAN GIO, HO CHI MINH CITY, VIETNAM

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### Abstract

Microplastic (MP) pollution represents a critical threat to coastal ecosystems and marine food security due to the high bioaccumulation potential in filter-feeding organisms. This study quantifies MP contamination in the commercially significant oyster, *Magallana belcheri*, within the Can Gio Mangrove Ecosystem, a UNESCO Biosphere Reserve. To ensure reproducibility, MP extraction was conducted by subjecting tissue samples (flesh and mantle-gill) to chemical digestion followed by density separation using a saturated NaCl solution. The resulting supernatant was filtered, and MPs were identified and categorized by shape, color, and size using stereomicroscopy. Oyster samples were collected monthly (August–October 2025) from three zones with varying anthropogenic pressures: Ha Thanh River, Dong Tranh River, and Thanh An Island. MP concentrations were determined based on tissue weight, ranging from  $0.133 \pm 0.116$  to  $0.200 \pm 0.0133$  items/g wet weight in the mantle-gill, and  $0.066 \pm 0.056$  to  $0.191 \pm 0.227$  items/g wet weight in the flesh. Characterization analysis revealed that fibers were the predominant morphology, accounting for over 50% of the total MPs, followed by fragments and films. Small-sized particles (<1 mm) were the dominant size fraction across all sites. Identified polymers included nylon, PET, and rayon, suggesting a link to local textile and domestic waste. These results indicate that local human activities are primary drivers of MP distribution. The observed concentrations in this bivalve highlight a significant pathway for human exposure, necessitating urgent, targeted pollution management in the region.

## DISTRIBUTION AND ECOLOGICAL RISKS OF MICROPLASTICS IN SEDIMENTS OF SOUTHERN VIETNAM

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### Abstract

Sediments act as important sinks for microplastics (MPs) in aquatic environments and may represent long-term sources of contamination to overlying water bodies. This study examined the occurrence, characteristics, and ecological risks of MPs in sediments collected near four large-capacity water supply plants in Southern Vietnam. MP abundances in sediment samples ranged from 21 to 63 items/m<sup>3</sup>, with particle sizes spanning 0.3-5 mm. The dominant MP morphotypes included fibers, fragments, films, and foams, accompanied by a diverse range of colors such as white, blue, transparent, green, red, black, and yellow. Polymer identification showed that sediments were primarily composed of polyethylene (PE), polypropylene (PP), low density polyethylene (LDPE), polyvinyl chloride (PVC), and other polymeric materials. Although the polymer hazard index (PHI) classified WTP 1 and WTP 3 as low-hazard sites due to the dominance of polyethylene, very high PHI values were observed at WTP 2 and WTP 4 as a result of PU occurrence. In contrast, both the pollution load index (PLI) and the potential ecological risk index (PERI) consistently indicated extreme ecological risks at all sampling locations, highlighting the combined influence of elevated MP concentrations and the presence of high-hazard polymers. Thus, the findings highlight the widespread occurrence of MPs in sediments at raw water intake zones and emphasize the urgent need for continuous monitoring and risk mitigation strategies to safeguard supply water sources in rapidly urbanizing and industrialized regions.

**Keywords:** *Microplastics, occurrence, sediment, water supply plants.*

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## FOUR YEARS MONITORING OF MICROPLASTIC IN THE BEIBU GULF, THE NORTHERN SOUTH CHINA SEA

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### Abstract

Beibu Gulf is an essential region of the microplastic fluxes in the northwest part of the South China Sea and, therefore in the Indo-China peninsula due to different coastal activities such as industry, tourism, urban development, intensive fishing, and loads of riverine discharge. Multiple samples from surface water, bottom water, and surface sediment were taken for this investigation from 2021 to 2025. The data indicate that the abundance of microplastics in the surface seawater of the Beibu Gulf is significantly lower than that in the northern Yellow Sea and the Yangtze River Estuary. The abundance of microplastics in the bottom seawater is significantly lower than that in the northwestern Yellow Sea, the Yangtze River Estuary, and the North Atlantic. The abundance of microplastics in the surface sediments of the Beibu Gulf is at a moderate to low level but shows an increasing trend year by year. The abundance of microplastics in nearshore surface seawater is significantly higher than in offshore areas, indicating a substantial contribution from human activities to marine microplastic pollution. The distribution of microplastics shows a gradual increase from east to west, reflecting the influence of the east-to-west coastal current. River inputs (from Guangxi, Hainan, and Vietnam) are one of the primary sources of microplastics in the Beibu Gulf. The western Guangdong coastal current transports microplastics from the Pearl River Estuary and the coastal waters of western Guangdong into the Beibu Gulf through the Qiongzhou Strait, serving as the second major source. Modeling studies suggest that the majority of microplastics entering the Beibu Gulf are further transported into the South China Sea, with only 1% being buried in the sediments of the Beibu Gulf. These research findings provide technical and theoretical support for the prevention and control of microplastic pollution in the Beibu Gulf.

## MARINE PLASTIC WASTE PREVENTION EFFORTS BASED ON LOCAL REGULATIONS AND COASTAL COMMUNITY PARTICIPATION IN SEMARANG CITY

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### Abstract

Marine plastic pollution is an increasingly pressing environmental issue in Semarang City, characterized by the growing accumulation of plastic in coastal areas and marine waters, which has led to ecosystem degradation, a decline in the quality of fishery resources, and socio-economic vulnerability among fishing communities. This situation is driven by high coastal industrial and economic activity, population density, weak source-based waste management, and low involvement of coastal communities. The urgency of preventing marine plastic waste demands a legal approach that emphasizes not only regulation but also strengthening community participation as key actors in coastal areas. This study aims to assess the adequacy of local regulations in Semarang City for preventing marine plastic waste and to develop a prevention model based on regulations and coastal community participation. The research method used is a normative juridical approach with legislative, conceptual, and policy approaches. The legal materials include legislation on waste management and the environment, as well as relevant scientific literature. The results indicate that regional regulations in Semarang City do not specifically and integrally regulate marine plastic waste prevention and do not optimally accommodate the strategic role of coastal communities. This study concludes that marine plastic waste prevention needs to be directed at harmonizing regional regulations, strengthening local institutions, and increasing coastal community participation through education, incentives, and community-based monitoring to achieve sustainable and environmentally equitable marine plastic waste management.

**Keywords:** *coastal areas, community participation, local regulations, marine plastic waste.*

## ECOLOGICAL AND HEALTH CONSEQUENCES OF MICROPLASTICS IN THE OCEANS

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### Abstract

Microplastics (MPs) have emerged as pervasive marine pollutants driven by rapidly increasing plastic production, short product lifespans, and limited recycling. Their occurrence and distribution in coastal and ocean environments are controlled by hydrodynamic and seasonal factors (e.g., currents, rainfall, turbidity), leading to spatiotemporal variability in abundance, size, shape, color, and polymer composition. Beyond physical contamination, MPs act as vectors and sinks for persistent organic pollutants, including PAHs and halogenated compounds (PCDD/Fs, PBDEs, PCBs), with evidence that contaminants can partition from surfaces into particle interiors, substantially increasing total sorbed loads. Ecological impacts are pronounced in coral reef systems, where MPs are found in sediments, seawater, and coral tissues/skeletons, indicating both external adhesion and ingestion pathways and raising concerns for reef resilience. Laboratory and field studies further show MP-induced oxidative stress, histopathological damage, altered extracellular polymeric substances, and shifts in microbial communities, with adverse outcomes also observed in aquatic organisms (e.g., shrimp) and human-relevant lung cell models. Collectively, these findings highlight intertwined ecological and health risks and underscore the need for improved monitoring, source control, and development of circular bioeconomy strategies to reduce plastic inputs and associated hazards.

**Keywords:** *microplastics, marine pollution, sorption, coastal sediment, coral reefs, POPs.*

## **IMPLEMENTING EU MARINE LITTER MONITORING FRAMEWORKS: PRACTICAL EXPERIENCE FROM THE NE BALTIC SEA**

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### **Abstract**

The European Union (EU) has established a harmonised framework for marine litter monitoring that enables comparable assessments across large sea areas. Member States are required to assess various aspects of marine litter: the amount of macrolitter on beaches, at the sea surface and on the seabed, as well as microlitter in surface waters, seabed sediments, and ingested by fish and invertebrates. The framework has clear strengths, including long-term commitment, methodological consistency, and shared priorities among Member States. However, experience from the North-East Baltic Sea, using Estonia as a case study, highlights several practical limitations relevant for certain regions.

Beach litter monitoring follows a long-established and harmonised methodology across Europe. In contrast, seabed litter monitoring in Estonia relies mainly on video-based surveys as an alternative to destructive bottom trawling used elsewhere. Although video-based methods are less accurate in litter detection, they allow larger areas to be covered. In low-transparency and shallow seas such as the Baltic Sea, seabed monitoring requires considerably more effort than in clearer waters. Moreover, comparing litter ingestion by fish and invertebrates across regions is challenging due to strong variability among species and locations. The low species diversity of the brackish Baltic Sea, together with the small body size of available shellfish and crustaceans, further limits the use of indicator species commonly applied in other European sea areas.

These examples illustrate some of the broader challenges in marine litter monitoring and provide a basis for discussing how harmonised frameworks can be adapted to diverse regional environmental conditions.

## PLASTIC DEBRIS MODULATES THE PARTITIONING OF EMERGING CONTAMINANTS IN MARINE ENVIRONMENTAL MATRICES

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### Abstract

Marine litter is ubiquitous in marine environments and, due to its hydrophobic surfaces and long environmental residence times, has the potential to sorb persistent contaminants of emerging concern and facilitate their bioaccumulation. Despite this potential, the role of plastic debris in controlling the environmental partitioning of these contaminants remains poorly quantified. In this study, we quantified the distribution of perfluorinated alkyl substances and organophosphate esters across dissolved water, suspended particulate matter, surface sediments, and plastic debris collected from Arctic coastal waters near Longyearbyen, Svalbard. Dissolved water, suspended particulate matter, sediment, and plastic debris were analyzed using high-performance liquid chromatography coupled with tandem mass spectrometry and gas chromatography coupled with mass spectrometry, and phase partitioning was evaluated using enrichment factor calculations supported by principal component analysis. Results show a clear gradient in sorptive capacity, with sediments exhibiting the highest enrichment factors, followed by plastic debris, while suspended particulate matter displayed much lower enrichment across all sites. These findings demonstrate that plastic debris, alongside sediments, functions as a key sink and carrier influencing the environmental fate of perfluorinated alkyl substances and organophosphate esters in coastal systems, whereas suspended particulate matter plays a comparatively minor role. This multi-matrix assessment provides new constraints on pollutant retention mechanisms and highlights the importance of incorporating particle-associated pathways into exposure assessments and monitoring frameworks for persistent organic contaminants across environmental media.

## FROM PLASTICS TO PLASTISPHERE: MULTI-OMICS APPROACHES REVEAL MICROBIAL SUCCESSION, BIOACTIVE CUES, AND MARINE ORGANISM ATTRACTION

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### Abstract

Since the mid-19th century, mass production and mismanagement of plastics have led to their pervasive accumulation in the global ocean, where floating debris forms novel habitats for microorganisms, algae, and plankton. These communities rapidly develop biofilms on plastic surfaces, creating a distinct ecosystem known as the “plastisphere”, whose composition varies with material type, location, and colonization time. Beyond acting as microbial “vehicles” that facilitate dispersal, plastisphere biofilms may harbor risk-associated taxa, functional gene clusters (including antibiotic resistance), and chemical cues that influence marine food webs by attracting organisms and increasing ingestion risk. In this study, we in-situ incubated six common plastics (PET, PP, PE, PLA, PS, and PE film) in natural marine environments for up to 8 weeks to characterize community succession and its ecological consequences. Using Oxford Nanopore Technologies full-length 16S rRNA and 18S rRNA sequencing, we compared bacterial and eukaryotic assemblages across plastic types and time points, revealing material- and duration-dependent differences in diversity and taxa turnover that generally increased in richness over time. To link community dynamics with organismal behavior, we performed attraction assays with two Taiwanese fish species representing different ecological niches observed that attraction patterns were associated with plastisphere communities at specific colonization stages, suggesting the involvement of key microbes, algae, or their metabolites. To probe potential mechanisms, we integrated LC-MS with community profiling to explore bioactive or odor-related metabolic products. Finally, we discuss strategies for leveraging rapid, Oxford Nanopore Technologies (ONT) to recover high-quality metagenome-assembled genomes from plastisphere microbiomes and to translate on-site genomic signals into actionable cultivation plans (e.g., medium composition, pH, temperature, oxygen requirements), accelerating the discovery and isolation of novel functional microbes from marine plastic habitats.

**Key words:** *Plastisphere, Oxford Nanopore Technologies, Biofilm succession, Marine organism attraction, Multi-omics*

## QUANTIFYING RIVERINE PLASTIC FLUX: A COST-EFFECTIVE BRIDGE-BASED COMPUTER VISION SYSTEM FOR VELOCITY AND ACCUMULATION ANALYSIS

*Ngo Anh Hieu*

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### Abstract

Marine litter, particularly plastic debris transported by rivers, is a dominant source of pollution threatening coastal and marine ecosystems. Effective prevention requires continuous, location-specific measurements of riverine plastic transport; however, existing monitoring approaches are often costly, energy-intensive, or unsuitable for long-term deployment. This study presents a cost-effective, bridge-based monitoring system designed for sustained observation of riverine marine litter and flow dynamics at fixed locations.

The proposed system integrates an edge computing platform equipped with a high-resolution camera and hardware acceleration, enabling real-time visual inference under strict energy constraints. A duty-cycled monitoring workflow is introduced, in which short data acquisition periods are followed by extended low-power idle states. This strategy reduces average power consumption by approximately seventy-two percent, supporting long-term operation using renewable energy sources.

On the software side, floating plastic debris is detected using a You Only Look Once–based object detection model trained on a benchmark floating debris dataset. The optimized model achieves up to eighty-five percent mean average precision, representing a nine percent improvement over baseline configurations. To quantify plastic flux and accumulation rates, the system tracks individual debris items across temporal sequences, enabling surface velocity estimation and the application of a trajectory-based line-crossing mechanism that ensures each object is counted exactly once.

The resulting measurements provide direct, location-specific metrics for identifying pollution hotspots and supporting policy evaluation related to riverine plastic mitigation. Future work will focus on extending the system toward continuous flux estimation to further support circular economy and marine litter prevention initiatives.

**Keywords:** *Marine Litter Prevention; Riverine Plastic Pollution; Cost-Effective Monitoring; Deep Learning Object Detection; Object Tracking; Knowledge Distillation; Edge Inference; Long-Term Monitoring*



## **STRAND 2**

**Fisheries and aquaculture: Engineering sustainable solutions for plastic products**

## **ARTIFICIAL INTELLIGENCE BASED MONITORING AND EARLY DETECTION OF PLASTIC WASTE IN FISHERIES AND AQUACULTURE**

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### **Abstract**

Plastic pollution is a major environmental challenge for fisheries and aquaculture. Floating and underwater plastic waste affects badly fish health, decreases water quality and troubles the Ecological balance. Conventional approaches of monitoring pollution take a long time, not regular and cannot detect early-stage pollution of plastic waste. This study suggests an Artificial Intelligence based monitoring system that uses drones, underwater cameras and deep learning techniques to detect plastic waste in real time. Studies highlights that drone images are commonly analyzed using object detection methods to detect plastic waste floating on the water surface. Similarly, researchers have used underwater cameras with segmentation models to detect plastic pieces and ghost nets under the water. The literature also states the use of location and environmental data to generate maps of plastic hotspots and to know where the pollution might be coming from. Many systems mentioned in the studies generate automated warnings, easy dashboards and informative data that allow fish farmers and government agencies to support quick action. The reviewed studies suggest that Artificial Intelligence based monitoring can improve sustainability, reduce environmental risks and support better management in aquaculture.

**Keywords:** *Aquaculture, artificial intelligence, early detection, fisheries, plastic waste*

## BIOPLASTIC: SUSTAINABLE ENGINEERING SOLUTIONS FOR VIETNAMESE FISHERIES

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### Abstract

Vietnam's fisheries and aquaculture sectors face increasing challenges from plastic pollution, which threatens marine ecosystems and the communities relying on seafood. Microplastics released from damaged nets, ropes, and aquaculture equipment can accumulate in marine organisms and enter the food chain, posing environmental and economic risks (Nabi et al., 2024; Hou et al., 2021; Kim et al., 2023). Addressing these issues requires solutions that integrate environmental sustainability and resource efficiency.

Bioplastics, such as polylactic acid (PLA), derived from renewable biological sources, provide a practical and sustainable alternative to petroleum-based plastics. They reduce pollution, improve waste management, and support circular economy practices within fisheries (Rossi et al., 2020; Arantzamendi et al., 2023). A key strategy is the utilization of agricultural and fishery by-products, such as straw, fish scales, and sugarcane bagasse, which minimize waste, lower production costs, and enhance value chains (Rossi et al., 2020; Hamin et al., 2022; N. Nagendran et al., 2025). Biocomposites made from these materials demonstrate sufficient durability and mechanical properties for applications in packaging, aquaculture equipment, and other operational uses, extending product life while remaining environmentally friendly (Mozejko Ciesielska et al., 2023; Budiman et al., 2022).

Circular economy initiatives, including the collection and recycling of discarded fishing gear and bioplastic products, combined with the active participation of local communities, industry, and authorities, can promote awareness, foster acceptance, and ensure effective adoption of sustainable materials (Do et al., 2019; Kim et al., 2023).

Bioplastics offer a multifaceted engineering solution for Vietnamese fisheries. By integrating sustainable materials, circular economy principles, and community engagement, this approach can reduce environmental impacts, enhance resource efficiency, and strengthen resilience and sustainability within the sector.

**Keywords:** *Bioplastics, Plastic pollution, Fisheries and aquaculture, Sustainability, Vietnam*



## REUSING PLASTIC IN AQUACULTURE TO PRODUCE UNC PLASTIC BRICKS, CONTRIBUTING TO ENVIRONMENTAL PROTECTION

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### Abstract

Intensive and super-intensive aquaculture practices have led to the widespread use of HDPE pond liners, generating a large amount of non-biodegradable plastic waste. This situation poses a serious environmental pollution challenge, with estimated plastic emissions exceeding 3 tons/ha/year. Converting this plastic waste into valuable building materials is a solution that not only minimizes the large amount of plastic waste released into the environment but also affirms the technical feasibility and economic efficiency of recycling plastic waste in aquaculture, providing a dual benefit of environmental protection and resource utilization. As a result, UNC plastic bricks are produced that meet technical standards for compressive/flexural strength and, notably, have extremely low water absorption (below 0.1%) and high abrasion resistance, superior to traditional bricks (Terrazzo). The transfer and application of this technology has actually opened up a new and sustainable direction in managing plastic waste in the aquaculture sector, contributing to minimizing ecological pollution and promoting a circular economy model.

## INNOVATIVE LIFECYCLE CARBON ACCOUNTING IN MARICULTURE: INTEGRATING SPECIES TRAITS AND ENERGY TRANSITIONS

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### Abstract

Mariculture, as both a carbon source and sink, plays a critical role in the global climate agenda and China's dual-carbon strategy. However, mariculture carbon emissions remain insufficiently quantified, particularly across the full lifecycle stages, species-level differences, and energy structure transitions. This study develops a lifecycle-based accounting framework to evaluate carbon emissions across China's mariculture sector, focusing on spatio-temporal variation, species-specific emission drivers, and low-carbon transition pathways. The framework captures emissions from feed production, farming, and processing, incorporating biological traits to explain interspecies differences in emission intensity. A system dynamics model is further employed to simulate future emission trajectories under three alternative energy structure scenarios. Results show that net carbon emissions fluctuated over time but declined in intensity, while stage-level contributions remained stable from 2013 to 2022, with farming consistently dominant. Emission intensity varied substantially among species, primarily due to differences in growth cycles and physiological traits. Spatial and temporal patterns revealed pronounced heterogeneity in emissions, though without strong regional clustering. Among all simulated scenarios, energy restructuring emerged as the most effective and scalable strategy for long-term decarbonization. These findings advance the methodological foundation for carbon accounting in aquatic food systems by integrating lifecycle analysis, biological differentiation, and dynamic energy modeling. While offering empirical insights for China, the framework is transferable to other contexts, supporting aquaculture's alignment with global climate and sustainability goals.

**Keywords:** *Life cycle assessment; Carbon accounting; Mariculture carbon emissions; Spatio-temporal characteristics; System dynamic*

## PFAS CONTAMINATION IN AQUACULTURE: CURRENT EVIDENCE AND RESEARCH NEEDS IN VIETNAM

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### Abstract

Per-/polyfluoroalkyl substances (PFAS) are a group of persistent, long-lasting and bioaccumulative pollutants that have been widely identified in aquatic environments and aquatic organisms worldwide. Numerous international studies have demonstrated that perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) are the most frequently detected PFAS in the tissues of fish, mollusks and crustaceans from both freshwater and marine ecosystems with bioaccumulation patterns strongly influenced by compound-specific chemical properties and species ecology. This study aims to synthesize current knowledge on PFAS occurrence and bioaccumulation in aquatic organisms and to evaluate the current research status in Vietnam as a basis for future development. Available studies indicate that PFAS have been detected in surface water, sediments and a limited number of aquatic organisms in Vietnam, primarily freshwater fish from urban areas such as Hanoi. Existing evidence suggests that PFAS in Vietnamese aquatic organisms generally occur at low to moderate concentrations with PFOS and several long-chain perfluorocarboxylic acids (PFCAs) detected in fish liver and muscle tissues; however, studies remain limited in spatial coverage, species diversity, and assessment of trophic transfer and exposure risks. Overall, the current evidence highlights substantial knowledge gaps in PFAS bioaccumulation in aquatic organisms in Vietnam, underscoring the need for more systematic and comprehensive studies to support environmental risk assessment and management.

**Keywords:** *PFAS, aquatic pollution, bioaccumulation, environmental occurrence, Vietnam.*

**Acknowledgement:** *This research is funded by Vietnamese-German University under grant number DTCS2025-009.*

## INNER AND OUTER AGEING OF POLYETHYLENE FISHING NETS BASED ON THE CARBONYL INDEX

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### Abstract

The increased use of long-lasting plastics in the fishing sector, especially polyethylene, is causing significant environmental problems such as ghost nets and microplastics. However, timely recycling can help maintain polymer quality, making it essential to assess the age and degradation state of plastics, as these factors directly influence the quality of recycled materials. This study analysed the oxidative degradation of Polyethylene high density fishing nets exposed for six months to natural weathering in Vietnam using attenuated total reflection Infrared-spectroscopy. The degradation profile was determined by investigating the carbonyl index of the outer surfaces and the fibre cores. The results show that significant oxidative ageing mainly occurs in the UV-exposed outer areas, with substantially higher carbonyl index than in the core material, which often resembles new Polyethylene. Statistical analysis revealed both surface-specific and position-dependent differences in ageing, even within single fibres, likely due to variable exposure during use. These results underline the importance of detailed condition assessments for recycling, as conventional IR surface analyses can significantly overestimate material degradation and thus underestimate recyclability. The findings of this study provide an important basis for the development of recycling strategies and diagnostic methods for marine plastics.

**Keywords:** *Recycling, plastic ageing, Fishing gear, carbonyl index, polyethylene, Vietnam*

## CHALLENGES IN PLASTIC WASTE MANAGEMENT IN INDUSTRIAL MARINE AQUACULTURE AND POLICY IMPLICATIONS FOR IMPROVEMENT IN VIETNAM

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### Abstract

Industrial marine aquaculture is a key pillar of Vietnam's blue economy, supporting large-scale seafood production and coastal economic development. The sector relies extensively on plastic-based materials such as HDPE cages, buoys, nets, ropes, pipes, and feed packaging. While these materials are essential for offshore and nearshore operations, their intensive use and gradual degradation have led to increasing plastic waste accumulation, posing risks to marine ecosystems and environmental quality.

Drawing on empirical evidence from industrial cage-based marine aquaculture areas in coastal Vietnam, together with national assessments of marine aquaculture development, this study examines the main challenges in managing plastic waste generated by industrial marine aquaculture activities. The findings indicate that plastic waste management remains fragmented, with limited source separation, insufficient collection and recycling mechanisms, and inadequate end-of-life management of aquaculture infrastructure. Gear loss during extreme weather events and weak enforcement of existing regulations further contribute to the leakage of macroplastics and microplastics into marine environments.

From a policy perspective, the paper identifies key governance gaps, including the absence of sector-specific technical guidelines for aquaculture plastics, limited integration of circular economy principles, and insufficient application of extended producer responsibility (EPR). The study proposes policy measures to strengthen plastic waste management in industrial marine aquaculture, including clearer regulatory requirements, incentives for recyclable and alternative materials, improved monitoring systems, and closer alignment with national marine litter and circular economy strategies.

## IMPACT OF ADOPTION OF PREVENTIVE MEASURES TO AVOID LOSING FISHING GEAR IN VIETNAMESE FISHERIES

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### Abstract

Preventing fishing gear loss is crucial for ensuring the sustainability and profitability of fisheries, as well as for reducing the environmental impacts of abandoned, lost, or otherwise discarded fishing gear (ALDFG). Lost gear not only represents substantial economic losses for fishers but also contributes significantly to marine litter, ghost fishing, and habitat degradation. This paper investigates the mechanisms behind fishers' decisions to adopt three preventive measures aimed at minimizing fishing gear loss: maintaining fishing gear, tracking gear, and training the crew. Using data collected from fishing households in Vietnam, the study examines how these preventive measures influence gear-related costs. An endogenous switching regression model was employed to account for potential selection bias and unobserved heterogeneity in the decision to adopt preventive measures. The results reveal that the adoption of gear maintenance and gear tracking practices significantly reduces the costs associated with gear loss. Importantly, counterfactual analysis indicates that even non-adopters would benefit from adopting these preventive strategies. Furthermore, fishers' experience, vessel scale, and perceptions of the environmental and economic consequences of ALDFG emerge as key determinants of adoption behavior. The findings highlight the importance of encouraging the uptake of preventive practices through targeted capacity-building programs, awareness campaigns, and support for technology adoption.

## POTENTIAL FOR INTEGRATING FISHING GEAR RECYCLING INTO CARBON CREDIT MARKETS IN VIETNAM

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### Abstract

Marine plastic pollution from abandoned, lost, or discarded fishing gear (ALDFG) is increasingly recognized as a serious pressure on Vietnam's coastal ecosystems. Although global initiatives such as the Global Ghost Gear Initiative and OECD guidance have highlighted the need for improved gear management, the possibility of linking end-of-life fishing gear treatment with market-based crediting mechanisms has received limited attention. This study examines whether recycling discarded nets and ropes can be incorporated into Vietnam's emerging carbon credit market, while also acknowledging the supplementary role that plastic-credit schemes may play in supporting plastic recovery efforts. A systematic review of scientific studies, technical reports, and national regulatory documents was undertaken, focusing on advances in biodegradable gear design, life cycle assessment (LCA) findings for derelict gear treatment, and evidence on greenhouse-gas (GHG) reductions associated with plastic recycling. The analysis of key policies - including the Law on Environmental Protection (2020), Decree 06/2022, Decree 119/2025, and Decision 232/QĐ-TTg- shows that Vietnam has established a basic institutional foundation for carbon-market participation. Findings indicate that recycling ALDFG offers measurable GHG savings relative to virgin polymer production, while at the same time reducing marine litter and contributing to circular-economy goals. However, persistent gaps remain, particularly the lack of standardized accounting methods for recycled fishing gear, inconsistent rules for plastic-credit certification, and weak collection systems in coastal provinces. Overall, the study suggests that integrating ALDFG recycling into the voluntary carbon market is technically achievable and could serve as a practical pilot approach that advances both climate-mitigation objectives and plastic-waste management in Vietnam.

**Keywords:** *Abandoned, lost, or discarded fishing gear (ALDFG); Carbon credit markets; Fishing gear recycling; Life cycle assessment (LCA); Circular economy; Plastic credit; Vietnam*



## **STRAND 3**

**Recycling and circular economy approaches: Innovations in marine debris and fishing gear management**

## COLLECTION AND RECYCLING OF PLASTIC WASTE FROM MARINE FISHERIES: INTERNATIONAL EXPERIENCES AND APPLICATION POTENTIAL IN VIETNAM

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### Abstract

Plastic waste from fishing activities — particularly abandoned, lost, or otherwise discarded fishing gear (“ghost gear”) — has become one of the most significant sources of marine pollution, directly affecting marine life, fishery resources, and coastal tourism. Based on a synthesis of international models, including port reception/take-back schemes, buy-back programs (gear-for-voucher exchanges), dedicated recycling chains, and community recovery initiatives, this study analyzes key success factors and barriers in implementation.

The findings indicate that programs achieve the best outcomes when supported by incentives for fishers, local preprocessing facilities, and stable downstream markets. In Vietnam, with a dense network of fishing ports and coastal communities, there is substantial potential to replicate such models; however, challenges remain due to limited recycling infrastructure, high logistics costs, and the absence of an Extended Producer Responsibility (EPR) framework. The study proposes a phased roadmap (0–12 months, 1–3 years, 3–7 years) with measurable KPIs and policy recommendations to enable effective implementation of a fishing-gear collection and recycling model in Vietnam.

### Key Findings:

- Port take-back programs combined with fisher incentives can collect over 1,800 tons of end-of-life fishing gear in pilot countries (e.g., Fishing for Energy, USA).
- The lack of downstream markets for recycled materials remains the most critical barrier to long-term sustainability.
- In Vietnam, a pilot across five fishing ports within 12 months could recover 100–200 tons of discarded gear, forming a foundation for material preprocessing and recycling within the next 1–3 years.

### Recommendations:

1. Establish port-based collection points with incentive mechanisms (e.g., vouchers or new gear) for fishers, and adopt standardized ALDFG data collection for performance evaluation.
2. Develop a closed-loop recycling value chain — from collection, cleaning, preprocessing to production — through public–private partnerships and promotion of “recycled-gear” product markets.
3. Introduce supportive policy frameworks: implement EPR for fishing gear, provide tax incentives for recycled products, and fund R&D on biodegradable or easily recoverable fishing gear materials.

## THE ROLE OF LIFE CYCLE ENGINEERING IN THE DESIGN OF RECYCLING PROCESSES FOR FISHING GEAR

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### **Abstract**

To design and manufacture products that support economic and social development while at the same time remain within the ecologic boundaries of our natural resources, a holistic perspective on all life cycle stages is required. This spans from raw material extraction and manufacturing to the use stage and subsequently end-of-life treatment of products, for instance by recycling. However, recycling processes require energy, materials and labor and, depending on the circumstances, closed-loop systems can be disadvantageous with regard to environmental and economic performance compared to open-loop or cascading material use. Life Cycle Engineering (LCE) aims at designing the stages of the product life cycle to achieve a higher environmental and economic performance.

With regard to the recycling of fishing gear, LCE is employed to define the product system developed in the REVFIN project encompassing the relevant processes from end-of-life collection to the refabrication into products. Based on this product system, the life cycle stages are subsequently analyzed and ecologic hot-spots identified that are the crucial for achieving an environmental benefit compared to reference material made from fossil resources.

## RECYCLABILITY OF HDPE FISHING NET UNDER DIFFERENT ENVIRONMENTAL AND ACCELERATED AGING CONDITIONS

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### Abstract

Recycling of fishing gear has gained increasing attention in recent years; however, knowledge of degradation mechanisms and clear criteria for determining end-of-recycling stages remains limited. This study examined the effects of sun exposure, seawater, and UV irradiation under natural and controlled conditions on the chemical–physical and mechanical properties of HDPE fishing nets over a six-month period. Specimens were produced from new nets and from nets exposed to natural sunlight and seawater for 1–6 months, while additional specimens from new nets were subjected to equivalent UV irradiation in a climate chamber. FTIR spectroscopy, differential scanning calorimetry (DSC), melt flow rate (MFR), and mechanical testing were used to evaluate changes in polymer structure and performance. Our results indicated that the FTIR spectra retained their characteristic peaks and the carbonyl index remained unchanged under all conditions during the six-month period, indicating negligible oxidation. DSC results showed stable melting temperatures and crystallinity throughout the six months, while MFR values exhibited no variation, confirming preservation of polymer molecular weight. Mechanical properties (yield strength, elongation at yield, and maximum impact force) also showed no significant differences compared with new nets, demonstrating high durability despite exposure to natural and artificial stressors. These findings indicate that HDPE fishing nets maintain structural and chemical stability after six months of environmental exposure, highlighting their strong potential for recycling after use; however, long-term studies are still required to establish robust end-of-life and end-of-recycling thresholds.

**Keywords:** *Climate chamber; Fishing gear recycling; HDPE; Mechanical properties; Seawater exposure; UV irradiation*

## RECYCLING PATHWAYS AND CIRCULAR ECONOMY OPPORTUNITIES FOR PLASTICS FROM FISHING GEAR

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### Abstract

Abandoned, lost or otherwise discarded fishing gear represents a major source of marine plastic pollution, contributing to ghost fishing, ecosystem degradation and the generation of microplastics. Fishing gear is commonly produced from high-performance polymers such as polyamide, polyethylene and polypropylene that provide high mechanical strength, durability and resistance to hydrolysis and environmental aging. These properties make plastic fishing gear suitable for fisheries operations but also result in persistent materials that are difficult to manage at the end of their service life. Within the wider transition toward a circular economy, the recycling of plastics from fishing gear has become an important approach for reducing marine litter and recovering valuable secondary materials. This review consolidates existing knowledge on the polymer composition and properties of fishing gear, the marine degradation and contamination processes that affect recyclability, and the main recycling pathways in use or emerging, including mechanical, chemical and energy recovery methods. The discussion highlights key requirements for effective pre-treatment, including collection, dismantling, sorting and cleaning, as well as the technical challenges and system level constraints that limit large scale adoption. The review also considers policy instruments that can enable circularity, including extended producer responsibility and design strategies that facilitate reuse and recycling, and identifies research directions needed to enhance material recovery. Overall, current evidence indicates that integrating polymer science with system level interventions in collection, design and governance is essential to close the loop for fishing gear plastics and to support sustainable fisheries in line with circular economy goals.

**Keywords:** *Fishing gear plastics, Marine pollution, Polymer degradation, Recycling technologies, Circular economy*

## THE ROLE OF LOCAL GOVERNMENT IN THE INTEGRATED MANAGEMENT OF ABANDONED, LOST, OR DISCARDED FISHING GEAR IN VIETNAM

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### Abstract

Marine debris, defined as “any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment”, is widely recognized as a global challenge that threatens marine ecosystems and the livelihoods of coastal communities. Plastics constitute the most abundant category of marine litter. In Vietnam, annual plastic waste entering the ocean is estimated at 0.28–0.73 million tonnes. Abandoned, lost, or discarded fishing gear (ALDFG) is considered a major source of this plastic pollution, accounting for approximately 30% of total marine debris in the country. While policies governing ALDFG are established at national and international levels, effective enforcement, monitoring, and community engagement occur primarily at the local level. This study reviews existing regulations and relevant case studies in Vietnam to identify the roles of local governments in ALDFG management. We reviewed laws and decisions issued at the national level since the adoption of the first Law on Environmental Protection in 1993. The search was conducted on official government websites on regulations using the keywords “law,” “decision,” “fishing gear,” “fishery,” “plastic waste,” and “marine environment.” We also conducted a similar search on the websites of major organizations working on development and environmental projects in Vietnam, including WWF, GIZ, UNDP, and FAO, to identify projects related to ALDFG management. This focused on projects implemented from 2019 onward, when the most relevant policies on ALDFG - namely the Law on Fisheries and the Decision No. 1746/QĐ-TTg, Introducing the National Action Plan for Management of Marine Plastic Litter by 2030 - came into force. The findings of this study provide insights into the opportunities and challenges faced by local authorities in preventing and reducing marine debris from fishing gear.

**Keywords:** *Marine debris, fishing gear, management, local government, Vietnam*

## DRONE APPLICATION TO MONITOR MARINE DEBRIS AND ESTIMATION SCHEME

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### 1. Preface

Marine debris, including plastic litter, consists of artificial materials mainly transported from land or sea and subsequently deposited around the shoreline or within the ocean. Because marine debris is transported by physical processes such as wind, waves, and currents, it might be desirable to consider debris-transport mechanics and governing equations to qualitatively and quantitatively simulate and forecast the distribution and quantity of debris.

In addition, monitoring techniques with appropriate accuracy are necessary to understand the origin of debris, its transport mechanisms, deposition processes, and volume estimation. This paper describes several large-scale artificial and natural marine-debris events in the western Pacific Ocean and around Kagoshima Prefecture. One example is a large-scale oil spill and its deposition in the East China Sea in 2018, and the other is pumice stones supplied by an underwater volcanic eruption in the western Pacific Ocean in 2021. Both events caused environmental damage and suspension of ship operation, thus economic impact, too.



*Photo 1. Deposition of oil spill in Takarajima island.  
(Famous Treasure Island by Stevenson, 1883)*



*Photo 2. Deposition of pumice.  
(Left upside photo is eruption at Mt. Shinmoe, Kagoshima)*

### 2. Development and Application of Drone Monitoring Techniques

The application of drones to marine-debris research is necessary from two main viewpoints. One is onsite monitoring of advection, diffusion, and deposition of marine debris (current situation). The second is the acquisition of reference data sets for calibration and verification of numerical models used to forecast debris distribution and to design countermeasures.

The Coastal Environment and Engineering Laboratory at the Faculty of Fisheries, Kagoshima University, operates various types of drones, including those equipped with high-resolution zoom lenses, thermal sensors, multispectral sensors, all-weather waterproof capabilities, old and new types. These drones are used for natural disaster surveys, environmental studies, nearshore-current

observations, productivity assessments, and more. For instance, Photo 2 shows marine debris—including numerous plastic items—on Takarajima Beach, Kagoshima Prefecture.

Several hundred aerial photographs were taken in a single drone flight and subsequently analyzed to obtain three-dimensional information on all objects within the images. Consequently, a four-dimensional marine-debris data set ( $x$ ,  $y$ ,  $z$ , and time) can be developed. The minimum recognizable debris size depends on the quality of the aerial imagery and the resolution of the analytical method; currently, debris with diameters on the order of a few millimeters can be detected. In general, finer resolution increases analysis time and reduces the spatial extent that can be processed.



Photo 2. 3-Dpoint cloud images of plastic buoys washed ashore and sediment characteristics on sandy beaches. Each point cloud data contains 3-D( $x$ ,  $y$ ,  $z$ ) coordinate, thus can measure size of material and profile (shape).

### 3. General Techniques to Simulate Marine-Debris Transport and Deposition

If debris is transported through a river, numerical modeling techniques for sediment transport may be applicable, although the characteristics of specific debris types require detailed study. When debris is transported from the open sea, wind and currents are the primary driving forces. However, numerical simulations for the oil-spill and pumicedeposition events in the East China Sea and western Pacific Ocean could not fully reproduce onsite conditions.

Therefore, the author recommended incorporating an additional transport term—wave-induced Stokes drift—based on qualitative observations of debris movement from the sky to numerical modelers. After including the Stokes-drift term in the Sanchi ship oil-spill simulation, one model's performance improved compared with the original version. However, most marine-debris transport models still do not incorporate up-wash and down-wash processes near the shoreline (in shallow water), and thus deposition has not been accurately simulated. To design effective countermeasures against large quantities of marine debris, modeling of the deposition process on a shore should be a major target of future research.

$$U = \frac{\pi^2 H^2}{2TL} \frac{\cosh 2k(h + z_0)}{\sinh^2 kh} = 7.69T \left(\frac{H}{L}\right)^2 \frac{\cosh 2k(h + z_0)}{\sinh^2 kh} \quad (\text{Eq. 1})$$

### 4. Conclusions

The development of drone-based monitoring techniques for marine debris including plastic litters is essential for estimating debris location, size, volume, and type. Moreover, drone-collected debris data sets can serve as reference information, improving numerical simulations of marine-debris transport and deposition.



### **Acknowledgements**

The author would like to express his sincere appreciation to Nha Trang University for hosting the conference and inviting him to participate.

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## CIRCULAR ECONOMY AND TOURISM DEVELOPMENT: INTERNATIONAL EXPERIENCE AND POLICY RECOMMENDATIONS FOR VIETNAM

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### **Abstract:**

In recent years, the large-scale and rapid development of Vietnam's tourism industry has given rise to numerous risk factors that threaten to disrupt the path toward sustainable development. Many traditional and renowned tourist areas with unique ecological potential are showing signs of environmental degradation, leading to a decline in their distinctive ecosystems. This situation poses significant challenges to the strategic direction of Vietnam's tourism development. At the same time, circular economy discussions in Vietnam's tourism sector remain fragmented, tool-focused (waste management, eco-labels, ad-hoc "green" initiatives), and insufficiently grounded in the country's concrete regulatory and market conditions. This paper addresses this gap by (i) clarifying the conceptual foundations of circular tourism in a concise manner; (ii) examining three representative international experiences (Samsø, Shandong, Krabi) through an input–process–output–outcome–impact (IPOOI) framework; and (iii) deriving Vietnam-specific policy recommendations. The paper's novelty lies in moving beyond descriptive case review toward a structured, transfer-oriented analytical model for circular economy-oriented tourism development in Vietnam

**Keywords:** *Circular economy, circular tourism, international experience, sustainable development, IPOOI*

## RECYCLING AND CIRCULAR ECONOMY APPROACHES: INNOVATIONS IN MARINE DEBRIS AND FISHING GEAR MANAGEMENT

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### Abstract

Marine plastic debris, particularly abandoned, lost, or otherwise discarded fishing gear (ALDFG), poses critical ecological threats and challenges the sustainability of global fisheries. This study analyzes the fishing gear lifecycle and proposes an integrated management framework based on circular economy principles to optimize resource recovery and recycling. The research identified key waste generation sources, including turnover rates of damaged gear requiring replacement, annual expired gear, and gear lost at sea. The assessment reveals critical bottlenecks in current management systems, specifically regarding on-board source segregation, insufficient port reception facilities, and fragmented processing workflows, all of which contribute to low recovery rates. Consequently, the research recommends four specific interventions designed to shift the fisheries plastic waste management paradigm toward recycling and circular economy principles: (1) Strengthening policy mechanisms aligned with extended producer responsibility (EPR); (2) Establishing financial incentive schemes (buy-back programs) to motivate fisher participation; (3) Implementing advanced recycling technologies; and (4) Enhancing communication strategies to shift behavioral patterns.

**Keywords:** *Abandoned, lost, or otherwise discarded fishing gear (ALDFG); circular economy; fishing gear lifecycle.*

## DEVELOPMENT OF SUSTAINABLE MATERIALS FROM END-OF-LIFE FISHING NETS IN VIETNAM VIA OPTIMIZATION OF RECYCLED AND VIRGIN MATERIAL BLENDING RATIOS

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### Abstract

The accumulation of end-of-life fishing nets has become a critical environmental challenge in Vietnam, contributing significantly to plastic pollution in marine ecosystems. This study investigates a sustainable approach to valorizing discarded fishing nets through mechanical recycling and subsequent blending with virgin polymers. Recycled high-density polyethylene (rHDPE) derived from end-of-life trawling nets was characterized and blended with virgin materials at various weight ratios to determine the optimal composition that provides mechanical performance comparable to that of virgin materials. The mechanical properties of the resulting blends were evaluated using tensile and Charpy impact tests. The results demonstrate that an optimal virgin-to-recycled material ratio of 80/20 yields mechanical properties comparable to those of the virgin polymer, enabling the production of sustainable materials suitable for substitution in equivalent applications. In addition, FTIR, DSC, and MFI analyses were reported in the study to interpret the obtained mechanical performance by the chemical composition, thermal behavior, and flow characteristics of the recycled material, the blends, and the virgin polymer. Overall, the findings highlight the strong potential for the practical reuse of end-of-life trawling nets in Vietnam as a valuable secondary resource for sustainable polymer applications, contributing to marine waste reduction and the development of a circular economy.

**Keywords:** *End-of-life fishing nets, recycling, rHDPE, circular economy*

## PLASTIC OCCURRENCE IN SEAGRASS MEADOWS AND WHAT WE ARE WORKING ON?

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### Abstract

Seagrass meadows are vital coastal ecosystems that provide food and shelter for diverse marine organisms and play a significant role in trapping sediments and anthropogenic debris, including plastics. This study investigates the occurrence and distribution of macro- and microplastics within seagrass ecosystems, with particular attention to seasonal variation and differences among seagrass species. Microplastics were predominantly observed on seagrass leaf surfaces in the form of fibers. The highest abundances were recorded in *Thalassia hemprichii* ( $2.75 \pm 1.89$  particles  $\text{cm}^{-2}$ ), followed by *Enhalus acoroides* ( $2.60 \pm 1.52$  particles  $\text{cm}^{-2}$ ) and *Halophila ovalis* ( $1.90 \pm 0.99$  particles  $\text{cm}^{-2}$ ).

In sediment samples, *E. acoroides* meadows exhibited the greatest concentration of microplastic fibers ( $98.90 \pm 21.19$  particles  $\text{g}^{-1}$ ), followed by *T. hemprichii* ( $76.18 \pm 17.66$  particles  $\text{g}^{-1}$ ), *H. ovalis* ( $26.50 \pm 8.70$  particles  $\text{g}^{-1}$ ), and unvegetated sandy areas ( $22.47 \pm 14.77$  particles  $\text{g}^{-1}$ ). Fragment-type microplastics were most abundant in bare sand ( $7.10 \pm 3.60$  particles  $\text{g}^{-1}$ ) and sediments associated with *E. acoroides* ( $7.06 \pm 7.06$  particles  $\text{g}^{-1}$ ). Polymer identification using ATR-FTIR revealed the presence of cellophane, polyamide-imide (PAI), polyethylene terephthalate (PET), polyamide (PA), polyetherimide (PEI), polyvinylidene fluoride (PVDF), and polymethyl phenyl siloxane.

These findings highlight the role of seagrass species and habitat complexity in influencing the accumulation and retention of microplastics within coastal ecosystems. Ongoing work further examines the pathways of microplastic transfer within seagrass-associated fauna and emphasizes the importance of community engagement and education to address marine plastic pollution.



## **STRAND 4**

**Plastics, Environment and Society: Awareness, Education and Social engagement**

## MARINE PLASTIC POLLUTION: STATE OF THE ART PROCESSES, RECYCLING POLICIES AND REGULATIONS

*Assoc.Prof Dr Nguyen Huu Ninh*

### Abstract

Marine plastic waste pollution is currently one of the most serious and urgent environmental challenges worldwide, due to the persistent nature of plastics and their long degradation time in natural environments. The accumulation of plastic waste in the ocean has caused significant negative impacts on marine ecosystems, biodiversity, and related socio-economic activities. Vietnam is recognized as one of the countries with relatively high levels of plastic waste leakage into the marine environment, mainly originating from domestic activities, tourism, fisheries, and inadequate solid waste management systems. In response to this issue, various policies, legal frameworks, research programs, and technological solutions have been developed and implemented to control, reduce, and manage plastic waste, with a particular focus on circular economy approaches. This study analyzes the current status of policies and regulations, modern treatment technologies, and plastic waste recycling practices in Vietnam. Based on this analysis, the study evaluates key achievements and existing limitations, and proposes several directions and solutions to improve the effectiveness of plastic waste management and recycling, thereby contributing to the mitigation of marine plastic pollution in the future.

**Keywords:** *Marine plastic pollution; Plastic waste management; Recycling technologies; Circular economy; Environmental policy; Vietnam*

## INNOVATING SUSTAINABLE EDUCATION WITH RECYCLED PLASTICS

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Principal, BVCOEW, Pune-India

### Abstract

Plastic pollution is a critical global problem that calls for inventive engineering solutions. Advanced recycling technologies—such as 3D printing with recycled PET (rPET) filaments derived from plastic water bottles—are transforming waste into sustainable resources. These technologies drive circular economic practices by reducing landfill waste and extending material lifecycles.

This keynote highlights the Unwood concept, an innovative approach that repurposes recycled plastics into wood-like, durable materials for educational infrastructure. Through 3D printing and filament extrusion technology, waste PET bottles are converted into robust, eco-friendly school furniture such as benches and tables. These products not only replace traditional wood, reducing deforestation, but also engage students and communities in sustainable practices.

The presentation examines the evolution of plastic recycling from mechanical reprocessing to modern 3D printing innovations, highlighting the environmental and social benefits. It demonstrates how engineering creativity empowers communities by creating cost-effective, locally sourced infrastructure. Integrating circular design with digital fabrication, this initiative demonstrates how technology can help build greener schools and foster environmental responsibility among future generations.

**Keywords:** *3D Printing, Sustainability, Unwood, Education, Plastic Recycling, Cost effective, Social Engagement*

## BUILDING A PLASTIC SMART CITY: AWARENESS, EDUCATION, AND SOCIAL ACTION FROM HUE, VIETNAM

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### Abstract

Marine litter, particularly plastic waste, poses a major threat to coastal and marine ecosystems. In response, the project “Hue – A Plastic Smart City in Central Vietnam” has been jointly implemented by WWF-Vietnam and the Hue City People’s Committee, with support from WWF-Norway. The initiative applies an integrated and data-informed approach that combines policy innovation, stakeholder collaboration, and behavior change communication to mobilize citizens and reduce plastic leakage into nature by 30% by 2025.

A mix of repeated and continuous communication-based interventions tailored to diverse target audiences, active engagement with multi-level stakeholders including public-private partnerships and government agencies and the Participatory Action-Oriented Training method were applied to strengthen awareness and drive sustained behavioral change.

By the end of 2024, Hue recorded measurable outcomes: full-scale waste segregation at source across 36 wards, a reduction of over 570 tons of plastic leakage (265% beyond target), and the establishment of 52 Plastic Reduction Schools, 25 youth environmental clubs, and an Environmental Information Center. More than 263,000 individuals and 578 food and beverage businesses adopted plastic reduction actions, while two organized scavenger groups were trained to enhance recycling efficiency and livelihoods.

The Hue experience highlights how education-driven engagement, participatory methods, and strong local leadership can foster systemic change toward circular economy practices. This model offers replicable lessons for community-based marine litter prevention in Vietnam and beyond.

**Keywords:** *Plastic waste reduction; behavior change communication; participatory action-oriented training (PAOT); stakeholder engagement; circular economy; Vietnam*

## FACTORS INFLUENCING FISHERMEN'S WILLINGNESS TO COLLECT ABANDONED FISHING GEAR IN KIEN GIANG PROVINCE, VIETNAM

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### Abstract

Abandoned, lost, and discarded fishing gear (ALDFG) poses significant threats to marine ecosystems, maritime activities, and human health worldwide. Vietnam ranks among the top five countries globally for marine litter emissions, with Kien Giang Province operating the largest fishing fleet in the country (4,269 vessels  $\geq 90$  HP, accounting for 11.36% of the national total). This study examined the current status, effectiveness, and challenges of ALDFG reduction measures in Kien Giang waters, while assessing fishermen's awareness and identifying factors influencing their willingness to participate in collection efforts. Between November 2023 and April 2024, a social survey was conducted across nine districts and municipalities in Kien Giang Province, with 500 questionnaires administered proportionally based on registered fishing vessel numbers at each site. Binary logistic regression analysis revealed that eight of eleven variables significantly influenced fishermen's ALDFG collection decisions, with the model explaining 30.3% of the variance (Nagelkerke  $R^2 = 0.303$ ,  $p < 0.001$ ). Navigation hazards emerged as the strongest predictor (OR = 1.994), followed by economic losses (OR = 1.881) and time consumption concerns (OR = 1.667). Larger hull lengths positively influenced collection behavior (OR = 1.175), while larger crew sizes reduced likelihood (OR = 0.877). Older fishermen showed greater collection propensity (OR = 1.036), whereas higher education levels unexpectedly decreased collection probability (OR = 0.436). These findings suggest that interventions emphasizing safety risks and economic benefits, combined with infrastructure support and capacity-building programs tailored to low-education fishing communities, could effectively enhance ALDFG recovery. Policy recommendations include establishing economic incentive mechanisms (VAT refunds, deposit-refund schemes, or cash-for-collection programs), developing adaptive training programs using visual and practical methods, fostering community-based initiatives, and strengthening multi-stakeholder collaboration among fisheries authorities, port operators, recycling companies, and fishing communities.

**Keywords:** *ALDFG, marine plastic waste, fishing gear, Kien Giang, Vietnam, fishermen awareness, logistic regression, waste management*

## ENHANCING COMMUNITY AWARENESS AND BEHAVIORAL CHANGE FOR PLASTIC WASTE REDUCTION IN MARINE TOURISM DEVELOPMENT IN QUANG NINH PROVINCE

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### Abstract

Plastic pollution constitutes a critical environmental challenge for coastal regions experiencing rapid tourism expansion, with significant implications for ecosystem integrity and socioeconomic sustainability. Quang Ninh Province, a principal marine tourism destination in Vietnam, is confronted with escalating single-use plastic waste streams originating from tourist consumption, tourism service provision, and coastal commercial operations. This research investigates the relationship between community environmental awareness, behavioral patterns, and active engagement in plastic waste reduction initiatives within key tourist destinations, including Ha Long Bay, Co To, and Van Đồn. Employing mixed-methods research design—integrating quantitative surveys, qualitative in-depth interviews with local residents and tourism sector stakeholders, and systematic field observations—this study identifies critical gaps in environmental literacy, deficiencies in existing waste management infrastructure, and sociocultural determinants affecting community participation in sustainability initiatives.

Findings demonstrate a significant discrepancy between elevated environmental awareness and inconsistent pro-environmental behavioral practices among community members. Principal barriers to behavioral alignment include limited accessibility to plastic alternatives, inadequate environmental communication strategies, and prevailing socioecological perceptions attributing waste management responsibility exclusively to governmental authorities. This study advances targeted evidence-based interventions: strengthening environmental education curricula, institutionalizing community-led conservation initiatives, incentivizing green tourism certification systems, and facilitating multi-stakeholder partnerships among local government agencies, tourism enterprises, and civil society organizations. These recommendations are designed to facilitate sustained behavioral transformation and contribute to circular economy principles in Quang Ninh's marine tourism sector, thereby advancing environmental sustainability and community resilience.

**Keywords:** *behavioral change, circular economy, community engagement, environmental awareness, marine tourism, plastic pollution, Quang Ninh Province, sustainable development.*

## EFFECTIVENESS OF THE AWARENESS-RAISING PROGRAM ON FISHING GEAR WASTE IN KIEN GIANG

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### Abstract

Abandoned, lost, or otherwise discarded fishing gear (ALDFG) represents a substantial source of marine plastic pollution in many coastal regions. This study assesses the effectiveness of an awareness-raising and capacity-building program on fishing gear waste management implemented in Binh An and Binh Son communes, as well as among students at Kien Giang University. The intervention consisted of structured training workshops, practical demonstrations, guided waste-sorting activities, and the integration of domain-specific content into higher-education curricula. Communication tools—such as instructional posters and applied sorting exercises—were employed to reinforce learning and support the adoption of environmentally responsible behaviors. Survey findings indicate that approximately 92% of participants improved their understanding of the environmental impacts of fishing gear waste; community willingness to engage in recycling activities increased by 40%; and over 80% of participating students adopted additional pro-environmental behaviors following the training. The results demonstrate that combining training, communication, and educational integration provides an effective approach for enhancing awareness and improving fishing gear waste management practices. This integrated model shows strong potential for replication in other coastal settings.

**Keywords:** *Circular economy, Community awareness, Marine plastic pollution, Fishing gear waste management, Training and education*

## UNLOCKING COASTAL POTENTIAL: A KAP ANALYSIS OF WASTE MANAGEMENT INTERVENTIONS IN BANDENGAN, CENTRAL JAVA

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### Abstract

This study place at Bandengan, a coastal subdistrict in Central Java. Bandengan plays a strategic role within Indonesia's blue economy, with local livelihoods largely dependent on fisheries and aquaculture. However, persistent plastic waste pollution in coastal and marine environments has increasingly disrupted these activities. In response, the local government introduced a community-based waste bank (bank sampah) program to address lack of management in plastic waste. This study examined the relationship between community knowledge, attitudes, and practices (KAP) regarding plastic waste pollution and residents' participation in the waste bank program. A mixed-methods approach was employed, integrating quantitative survey data with qualitative insights derived from in-depth interview to capture both behavioral patterns and collective perceptions. The findings reveal that baseline environmental awareness among community members remains relatively low, limiting voluntary engagement in plastic waste management initiatives. Nevertheless, incentive-based mechanisms, particularly the "Free Vegetables" scheme, have proven effective as an initial catalyst for participation, encouraging involvement despite limited intrinsic environmental concern. Continued participation gradually contributes to improved environmental understanding and shared responsibility. These results suggest that incentive-driven participation serves as a pragmatic entry point rather than an end in itself, underscoring the importance of combining short-term incentives with sustained educational strategies to strengthen long-term, community-driven plastic waste management in coastal regions.

**Keywords:** *Coastal, plastic, pollution, community, participation, incentive-based, waste-management; Kendal; Indonesia*

## COASTAL PLASTIC WASTE MANAGEMENT: AN EMPIRICAL STUDY OF COMMUNITY ENGAGEMENT AND AWARENESS IN MANGUNHARJO

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### Abstract

The accumulation of plastic waste in the coastal ecosystem of Mangunharjo, Semarang, constitutes a critical environmental and socio-economic challenge, posing serious threats to marine biodiversity and the sustainability of local tourism. This study examines the integrated action model implemented by the Back Indonesia Community, with particular attention to its three strategic pillars: environmental education, structured coastal clean-up initiatives, and the institutional integration of community-based waste bank systems. A mixed-methods research design was employed. This study combines qualitative data from in-depth interviews and participatory observation with quantitative waste audit measurements to comprehensively assess behavioral change, social participation, and material waste-reduction outcomes. The analysis demonstrates that active community involvement plays a pivotal role in fostering environmental awareness, particularly in shaping local residents' understanding of the urgency and long-term impacts of plastic pollution. The findings indicate that sustained community engagement not only enhances environmental literacy but also promotes collective responsibility and long-term commitment to sustainable waste management practices. Furthermore, the Back Indonesia model offers a replicable framework for community-driven coastal plastic waste management and offers helpful advice on participatory environmental governance in developing coastal regions. These results highlight that meaningful public participation is a key mechanism through which awareness of plastic pollution is translated into concrete environmental action.

**Keywords:** *coastal, plastic, waste, community-based, management, awareness, Semarang, Indonesia*

## PLASTIC WASTE MANAGEMENT IN KARIMUNJAWA SMALL ISLAND MARINE PROTECTED AREA: FAST PYROLYSIS AND GOVERNANCE INTEGRATION

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### Abstract

Small island ecosystems are highly vulnerable to environmental degradation due to limited land capacity, intensive tourism pressure, and persistent deficiencies in waste management systems. In Karimunjawa National Park and Marine Protected Area, Central Java, Indonesia, land-based plastic waste represents a critical source of marine pollution, posing direct risks to coral reef integrity, protected terrestrial habitats, and the sustainability of coastal livelihoods. This study critically examines an integrated plastic waste management intervention that combines technological innovation with cross-sectoral governance arrangements to reduce plastic leakage in a small island context. The intervention involves the application of Fast Pyrolysis 5.0 (Faspol 5.0), a waste-to-energy technology that converts plastic waste into liquid fuel (Petasol) under oxygen-limited conditions, embedded within a collaborative framework involving Academic-Business-Government-Community actors. A mixed-methods research design was employed. Quantitative analysis estimated plastic waste generation and accumulation across households, tourism facilities, and accommodation services. Qualitative data were collected through focus group discussions and in-depth interviews to examine stakeholder roles, institutional coordination, and governance dynamics influencing implementation outcomes. The results indicate a measurable reduction in unmanaged plastic waste flows, accompanied by improved local waste handling practices and strengthened institutional coordination. The findings indicate that the efficacy of Faspol 5.0 is dependent on governance alignment, stakeholder engagement, and contextual appropriateness within safeguarded small island ecosystems, rather than treating technology as an isolated solution. This study contributes empirical evidence on the role of integrated technological and governance approaches in mitigating plastic pollution pressures in ecologically sensitive marine protected areas.

**Keywords:** *Plastic pollution; Karimunjawa; Fast pyrolysis; Waste management; Coastal livelihoods*

## ENHANCING LIVELIHOODS IN NHA TRANG: THE WASTE PICKERS' ROLE IN ADVANCING VIETNAM'S CIRCULAR ECONOMY FRAMEWORK

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### Abstract

In Vietnam, rising consumption of goods and services continues to challenge progress toward the Sustainable Development Goals (SDGs), particularly SDG 12 on sustainable consumption and production and SDG 14 on life below water. To counter these impacts, the Vietnamese government has adopted circular-economy policies, including the National Action Plan for Circular Economy to 2035, which sets measurable targets for waste reduction and resource efficiency. However, municipal waste systems still struggle to cope with growing waste volumes and effective segregation, leaving the informal sector to manage a substantial share of recyclable materials. This study examines the roles and vulnerabilities of informal waste pickers within the recycling ecosystem of Nha Trang, a coastal city facing increasing waste leakage into marine environments. Using cross-sectional survey and interview data, we analyse the types of recyclables collected, relationships with commercial recycling centers, income patterns, and health and safety risks. Findings show that recyclables constitute a critical livelihood resource for waste pickers, whose need for daily income often outweighs concerns about occupational hazards and limited social protection. The study highlights the need for policy interventions that formally recognize waste pickers' contributions, improve their working conditions, and integrate them into a cooperative registration system. Such measures would strengthen Vietnam's circular-economy transition while enhancing social equity within the waste management sector.

## FROM EVIDENCE TO ACTION: CITIZEN SCIENCE INSIGHTS ON MACROPLASTIC POLLUTION IN VIET NAM'S MARINE PROTECTED AREAS

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### Abstract

Marine plastic pollution is a persistent threat to marine ecosystems, biodiversity, and fisheries-based livelihoods in developing coastal countries such as Viet Nam. Fisheries have a dual role: they contribute to marine plastic pollution, and they are strongly affected through gear damage, reduced fish stocks, navigational hazards, and degraded fishing grounds. This study reports results from a marine debris monitoring programme in Viet Nam (2019–2023). The programme used a citizen science approach, engaging local communities, Marine Protected Area (MPAs) and National Park (NPs) staff, fishers, and volunteers. It aimed to generate policy-relevant evidence to support fisheries governance reforms, fisheries action plans on plastic reduction, stronger Extended Producer Responsibility (EPR) for the fisheries sector, and behaviour change in fisheries-dependent communities.

Standardized surveys were conducted on 33 beaches in 11 MPAs and NPs, and at selected coral reef sites. Ten monitoring campaigns (two per year, 2019–2023) recorded 345,989 debris items. Mean density was 52.11 items  $m^{-1}$  and mean mass was 963.8 g  $m^{-1}$ . Plastics dominated, representing 91.13% of total items and 63.62% of total mass. Over time, the number of plastic items gradually declined, but plastic mass did not show a statistically significant reduction.

This suggests some awareness and behaviour shifts, but persistent leakage sources remain. Source classification showed fisheries-related plastics (polystyrene buoys, ropes, nets, floats, and fishing lines) as the main category (57.26% of items; 52.30% of mass). This points to governance gaps across capture fisheries, aquaculture, and seafood value chains, including limited gear life-cycle management, inadequate waste reception at ports and landing sites, and weak incentives for gear retrieval and take-back schemes. Offshore island MPAs had the highest pollution, followed by nearshore islands and mainland sites. Southern Vietnam had a higher abundance and mass of plastic than the central and northern regions. On coral reefs, plastics comprised ~70% of items and ~50% of mass. This study demonstrates that citizen science can provide long-term, standardized data and support stakeholder participation in developing practical solutions for MPAs to reduce plastic pollution and its impact on biodiversity and the marine ecosystem.



# POSTER SESSION

## MICROPLASTIC POLLUTION FROM RAW WATER SUPPLY SOURCE: A CASE STUDY IN SOUTHERN VIETNAM

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### Abstract

Microplastics (MPs), which are globally detected across various environments, have attracted significant attention due to their potential threat to water quality, especially water supply systems. In this study, surface water samples were collected at raw water intake zones of four large-capacity water supply plants in Southern Vietnam. MP concentrations in surface water ranged from 10 to 44 items/m<sup>3</sup> across the investigated sites. The detected MPs predominantly occurred as fragments and fibers, with particle sizes spanning 0.3-5 mm and displaying a broad spectrum of colors. Polymer identification using Fourier Transform Infrared spectroscopy (FTIR) revealed that polyethylene (PE) and its derivatives (LDPE and HDPE) were the most abundant polymers, followed by polypropylene (PP). Notably, high-hazard polymers such as polyurethane (PU) were sporadically detected at certain intake locations. Ecological risk assessment based on the polymer hazard index (PHI) indicated substantial spatial variation, with sites containing PU exhibiting very high hazard levels, while PE-dominated sites showed comparatively low polymer hazard. However, the pollution load index (PLI) and potential ecological risk index (PERI) consistently classified all sampling locations as presenting extreme ecological risk. These findings demonstrate that raw water supply source supplying water treatment plants are subjected to significant MP contamination and highlight the necessity for routine MP monitoring and risk-oriented management strategies in rapidly urbanizing regions.

**Keywords:** *Microplastics, occurrence, surface water, water treatment plants.*

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## INCREASING THE RECYCLING RATES OF POST-USE FISHING ROPES: THE ROLE OF CLEANING PROCESSES AND THE POSSIBILITIES OF A SYSTEMATIC INDIVIDUAL-PRODUCER-RESPONSIBILITY IMPLEMENTATION

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Kien Giang University

### Abstract

Plastics from fishing gear represent a significant source of marine pollution, with post-use fishing ropes made of high-density polyethylene (HDPE) and polypropylene (PP) posing both environmental challenges and recycling opportunities. This study investigates the mechanical recyclability of post-use fishing ropes and the effect of washing processes on material recovery. Used ropes collected from Vietnamese fisheries were sorted, subjected to up to five washing cycles, and analyzed through FTIR spectroscopy, differential scanning calorimetry (DSC), and mechanical testing. Results indicate that washing significantly reduces surface impurities, leading to improved flexural modulus and yield strength of the recyclates, while impact strength remains largely unaffected. Both old bright (OBR) and old dark ropes (ODR) retain accessible crystallinity and mechanical properties comparable to virgin material when optimally washed. The study demonstrates that the mechanical properties of recycled material are sufficient for reintegration as up to 25% recyclate in new fishing ropes, supporting circular economy goals and forthcoming EU requirements for recycled content. Our findings underscore the feasibility of closed-loop recycling for fishing gear polymers and advocate for integrating washing steps and producer responsibility schemes to improve material circularity and reduce marine plastic pollution.

## POTENTIAL INGREDIENTS SUSTAINABLE REPLACEMENT FOR FISH MEAL IN SHRIMP FEED

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### Abstract

Aquaculture in Vietnam has been continuously developing in recent years. From 2018 to 2024, aquaculture production increased from 4.1 million tons/year to 5.753 million tons/year (approximately 38%). This development, in line with the aforementioned direction, is driving growth in aquaculture feed production. In 2024, aquaculture feed production is projected to reach 5.39 million tons, including 1.4 million tons for shrimp; 2.02 million tons for pangasius; and 1.97 million tons for other aquatic species. Fishmeal typically accounts for a high proportion of aquaculture feed, especially for shrimp and carnivorous fish. In aquaculture feed, fishmeal is a crucial and essential component. It is a valuable source of protein, superior to other protein sources. However, the extensive use of fishmeal in aquaculture feed production poses several unsustainable challenges, primarily the potential for shortages as global demand increases. Vietnam's fishmeal raw material largely originates from trawling, a practice considered unsustainable, particularly bottom trawling which causes the most disturbance to the seabed worldwide. These environmental impacts are crucial for organizations assessing and certifying aquaculture sustainability, such as the Marine Stewardship Council (MSC). International demand for sustainable aquaculture products (ASC, BAP, GlobalGAP) necessitates the search for alternative fishmeal sources in aquaculture feed. This research focuses on reviewing and evaluating the potential of alternative fishmeal sources in shrimp feed, thereby proposing appropriate solutions to reduce pressure on fisheries, especially trawling, in Vietnam.

**Keywords:** *Fishmeal; sustainable feed; sustainable farming; sustainable fishing*

## TOWARDS SUSTAINABLE URBAN DEVELOPMENT: COMMUNITY SATISFACTION WITH PUBLIC TRANSPORTATION IN KHANH HOA PROVINCE

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### Abstract

Sustainable urban transportation is vital for green growth and climate resilience in coastal cities. Planning must align with marine environments to minimize ecological impacts - specifically plastic waste and surface sea pollution - while enhancing resilience to natural hazards. Energy-efficient, intelligent systems are essential for long-term sustainable development.

- **Background and Rationale:** This study addresses the urgent need for sustainable transit in Khanh Hoa province. It emphasizes aligning transport planning with coastal conditions to reduce environmental footprints and mitigate plastic waste discharge into the ocean.
- **Aim/Purpose:** This study identifies factors affecting local community satisfaction with public transportation services in a coastal context.
- **Theoretical/Conceptual Framework:** The research is grounded in the satisfaction model and the SERVQUAL framework, integrated with environmental impact indicators, which together examine how service quality dimensions and pollution control measures influence community satisfaction.
- **Methodology:** Data were collected from 600 survey questionnaires at bus stations and analyzed using SPSS through reliability testing (Cronbach's Alpha), exploratory factor analysis (EFA), and multiple linear regression.
- **Findings/Results:** Six factors were found to influence community satisfaction, including responsiveness (strongest determinant), tangibles, perceived cost, timeliness, safety and security, and service capacity. The findings indirectly indicate a community demand for more sustainable and cleaner public transportation options, including reduced plastic waste.
- **Discussion/Implications:** Findings offer recommendations to improve bus services and implement waste management protocols at transit hubs to prevent plastic pollution, supporting the province's sustainable goals.

**Type of Contribution:** Empirical research (with data)

**Keywords:** *public transportation, community satisfaction, sustainability, Khanh Hoa, plastic waste, sea pollution.*

## BALANCING ECONOMIC AND ENVIRONMENTAL PERFORMANCE OF COASTAL WASTE MANAGEMENT: A CIRCULAR ECONOMY ASSESSMENT IN KARIMUNJAWA

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### Abstract

The rapid development of marine tourism in Karimunjawa has placed increasing pressure on the coastal waste management system, which must accommodate waste from the accommodation and household sectors. This study aims to quantify waste generation and examine the economic and environmental implications within a circular coastal economy framework. The study used a mixed-methods approach through waste audits, occupancy-based estimation, and Material Flow Analysis with 37 respondents consisting of accommodation managers, households, and government stakeholders. The economic analysis was conducted by calculating the resource recovery rate (RR) and circular value loss (CVL). The results show that approximately 90 accommodation units generate approximately 2.5 tons of waste per day (27.8 kg/unit/day), dominated by plastic (62%) and paper and tissue (25%). Domestic waste generation from approximately 600 households is estimated at 3 kg/household/day, and is largely managed through open burning. Tourism waste has entered processing facilities, but its capacity is limited; Only  $\pm 5$  kg of plastic per day is processed into fuel, resulting in a RR of around 0.2%. The estimated economic value of the material shows that the recovery potential reaches  $\pm$ Rp5.75 million per day, but the realization of utilization is only around Rp150 thousand per day, resulting in a circular value loss of  $\pm$ Rp5.6 million per day. This gap places coastal waste management as a cost center, while increasing the risk of marine pollution, open burning emissions, and degradation of the environmental quality of small islands. This finding emphasizes the urgency of investing in recovery technology, expanding waste services, and integrating the circular economy into coastal tourism governance..

**Keywords:** *Karimunjawa, tourism, waste, economic, environment, management, sustainable*

## ENHANCING HUMAN RESOURCE QUALITY THROUGH EMPOWERING STAKEHOLDERS IN SUSTAINABLE TOURISM EDUCATION

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### **Abstract**

In the context of sustainable tourism becoming an inevitable trend, human resource training requires not only knowledge acquisition but also execution competence and critical thinking. This paper proposes a solution to bridge the gap between theory and practice through a strategic trilateral cooperation model: University - Enterprise - NGO, evidenced by its implementation at Nha Trang University University. The study analyzes and evaluates the effectiveness of practical training activities. The results confirm that fostering close cooperation among these stakeholders does not merely provide updated knowledge but constructs sustainable action competencies for learners. Through interactive learning processes, students achieve a profound transformation from concrete experiences to critical thinking and problem-solving skills, meeting the rigorous demands of the high-quality tourism labor market.

**Keywords:** *Sustainable Tourism, Stakeholders*

## FACTORS INFLUENCING THE CHOICE OF GREEN TOURISM AIMED AT REDUCING MARINE DEBRIS IN AN GIANG

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### Abstract

An Giang's coastal and island tourism has been developing rapidly and has become a key economic sector of the locality. However, the growth of tourism activities has generated a substantial amount of marine debris, exerting negative impacts on the ecological environment, landscape quality, and the sustainability of destinations. In this context, the development of green tourism and the encouragement of tourists to choose environmentally friendly tourism products are regarded as important solutions to reducing marine debris. This study focuses on analyzing the factors influencing tourists' selection of green tourism products in An Giang's coastal and island areas. Accordingly, the research clarifies the relationship between green tourism consumption behavior and the potential for mitigating marine debris at destinations. The findings contribute to proposing solutions to promote the development of green tourism, aiming to reduce marine debris and foster the sustainable development of An Giang's coastal and island tourism.

**Keywords:** *Green tourism, marine debris, coastal and island tourism, An Giang.*

## INVESTIGATING AWARENESS AND ENGAGEMENT POTENTIAL TO REDUCE MARINE PLASTIC SOURCES

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### Abstract

Plastic pollution is a systematic issue that must be solved on higher levels with policies and regulations. However, human activities, e.g. shipping or waste management, directly cause marine plastic pollution. Hence, individual behavior can play an important role in understanding and mitigating marine plastic sources. Raising awareness can alter engagement and thereby change pollution sources on an individual level. The goal is to investigate awareness and engagement in individuals regarding marine plastic pollution to better understand how this can change marine plastic sources and integrate the results in a plastic pollution source map.

Therefore, a cooperation with an NGO that supports individual engagement in marine litter cleaning is pursued aiming to investigate participants' engagement and awareness, as well as changes in behavior. Quantitative surveys with participants are planned during the engagement in the cleaning efforts, as well as follow-up surveys, both at different locations in the Baltic Sea area. The surveys include geographical and demographic information of the participants to investigate potential correlations. Additionally, interviews with participants at different locations is planned, to gather more deep knowledge on motivation and framing of the issue. Based on the gathered data, changes in awareness, engagement, and behavior can be integrated in spatial source maps. The results can then support effective mitigation efforts that are spatially specific and include an individual level, as well as promoting a societal shift.

