

Message from the Hon. Prime Minister

It is with great pleasure that I extend my warmest wishes to the 3rd International Conference on Plastics, Innovations, and Environmental Sustainability (ICPIES 2026), which brings together researchers, academics, industry professionals, policymakers, and students from Sri Lanka and around the world to advance the global dialogue on sustainable environmental solutions.

The theme of ICPIES 2026 is both timely and significant. Plastic pollution has emerged as one of the most pressing environmental challenges of our time, with far-reaching consequences for ecosystems, human well-being, economic development, and the future of our planet. Addressing this challenge requires innovative thinking, sound policy, responsible production and consumption practices, technological advancement, and active public participation. This conference provides an important platform to examine the complex dimensions of plastic pollution and to explore practical, innovative pathways towards environmental sustainability.

The focus of ICPIES 2026 on plastic pollution and its impacts, circular economy approaches, waste management policy and governance, environmental sustainability innovations, AI and smart environmental monitoring, climate change and ecosystem resilience, and community engagement for a plastic-free society reflects the interconnected nature of contemporary environmental challenges. By bringing together diverse perspectives and expertise, the conference fosters the interdisciplinary collaboration necessary to develop effective and lasting solutions.

Sri Lanka remains firmly committed to advancing sustainable development, strengthening environmental governance, promoting responsible resource management, and building resilient communities. In this context, accelerating the transition towards a circular economy and advancing innovative approaches to waste management and plastic pollution are national priorities. Emerging technologies, including artificial intelligence and smart environmental monitoring systems, offer new opportunities to better understand environmental challenges, support evidence-based policymaking, and enhance the effectiveness of sustainability initiatives.

Conferences such as ICPIES 2026 play a vital role in promoting knowledge exchange, research collaboration, and partnerships among academia, government, industry, civil society, and local communities. The participation of international researchers and institutions further enriches opportunities to share experiences, identify common challenges, and develop collaborative solutions that contribute to a cleaner, healthier, and more sustainable future for all.



I am confident that the discussions, research findings, and partnerships emerging from ICPIES 2026 will make a meaningful contribution to both national and global efforts to address plastic pollution and advance environmental sustainability. I encourage all participants to engage actively, exchange knowledge openly, and work together to translate research and innovation into practical action.

I wish the organizers, participants, and all those associated with the 3rd International Conference on Plastics, Innovations, and Environmental Sustainability (ICPIES 2026) every success in their deliberations and future endeavors.

Dr. Harini Amarasuriya
Prime Minister,
Democratic Socialist Republic of Sri Lanka
Minister of Education, Higher Education and Vocational Education

Message of the Vice Chancellor, The Open University of Sri Lanka

It is with great pleasure that I extend my warm greetings to all participants of the 3rd International Conference on Plastics, Innovations, and Environmental Sustainability (ICPIES 2026), organized by the Faculty of Engineering Technology of The Open University of Sri Lanka. As an institution committed to expanding access to knowledge and promoting lifelong learning, we are proud to provide a platform that brings together scholars, practitioners, policymakers, industry professionals, and students to share research, experiences, and perspectives on one of the most important areas of contemporary environmental discourse.



The conference provides an excellent opportunity to connect research with practice and to encourage interdisciplinary perspectives on plastics and environmental sustainability. I particularly value the opportunity this conference creates for emerging researchers and students to engage with experts, present their work, receive constructive insights, and develop professional and academic networks. Such interactions are essential for strengthening the research culture of our university and encouraging innovative thinking that can respond to real-world environmental and societal needs.

I commend the Faculty of Engineering Technology and the organizing committee for their dedication in convening ICPIES 2026 and for creating a space where knowledge can be exchanged across disciplines and sectors. I am confident that the contributions presented at this conference will enrich academic scholarship and encourage further research, partnerships, and educational initiatives in this field. I wish all presenters, researchers, participants, and organizers a rewarding and successful conference experience.

Senior Professor P. M. C. Thilakerathne
Vice-Chancellor
The Open University of Sri Lanka
Sri Lanka

Messages from Dean of Faculty of Engineering Technology; The Open University of Sri Lanka

As innovators from diverse backgrounds unite to design a cleaner and brighter future. I am honoured to welcome all participants to the 3rd International Conference on Plastics, Innovations, and Environmental Sustainability (ICPIES 2026), hosted by the Faculty of Engineering Technology at the Open University of Sri Lanka.

This year's theme, "Transformative Green Innovations for Environmental Sustainability, Ecosystem Resilience, and Social Wellbeing," responds to the global demand for a responsible innovation. As engineers, scientists, and technologists, we have a responsibility to ensure that progress does not compromise environmental integrity. Eco driven advanced protect the planet while also promoting social equity and economic property, generating benefits for all. At the Faculty of Engineering Technology, we are committed to preparing future engineers, technologists, and researchers with both technical expertise and a strong dedication to sustainability. ICPIES 2026 provides students and the academic community with opportunities to engage with international experts, pioneering research, and practical solutions that integrate science, technology, and society.



I extend my sincere gratitude to the steering committee, technical committees, distinguished speakers, and all contributors for their dedication to making this event possible. Their efforts have established an environment that fosters meaningful knowledge exchange and impactful collaboration.

I encourage all participants to utilize this platform to share research, build new networks, and establish collaborations that continue beyond the conference. To promote meaningful connections and co-creation, I invite each of you to identify and connect with at least one cross-disciplinary collaborator during ICPIES 2026. This initiative is intended to transform networking into actionable partnerships and foster lasting professional relationships. I wish everyone a valuable and rewarding experience at ICPIES 2026.

Dr. L.S.K. Udugama

Dean
Faculty of Engineering Technology
The Open University of Sri Lanka
Sri Lanka

Messages from Conference Chairs: Prof. Jagath Manatunge

There are moments when knowledge must do more than explain the world; it must help change its direction. ICPIES 2026 is intended to be one such moment.

Plastic pollution is no longer merely a waste-management problem. It is a challenge that reaches across ecosystems, human health, climate, economies, governance, technology, and social behaviour. The question before us is therefore no longer simply how we manage plastics, but how courageously we are prepared to redesign the systems that create, consume, recover, regulate, and ultimately value them.



The 3rd International Conference on Plastics, Innovations and Environmental Sustainability (ICPIES 2026) brings together researchers, professionals, policymakers, industry leaders, innovators, educators, and communities around a shared conviction: environmental sustainability cannot be achieved by isolated solutions. It demands science that crosses disciplines, innovation that moves beyond laboratories, policy informed by evidence, industries willing to transform, and societies prepared to participate.

The papers contained in these Proceedings represent more than academic contributions. Each is part of a larger conversation about the kind of future we choose to build one in which technological progress and environmental responsibility are not competing ambitions, but inseparable foundations of human wellbeing.

My hope is that ICPIES 2026 will not be remembered merely for the ideas presented here, but for the ideas that left these pages and became action: a new investigation begun, a technology advanced, a policy reconsidered, a partnership formed, a community empowered, or an environmental burden prevented.

To every author, reviewer, keynote speaker, participant, partner, and member of the organising team, I extend my deepest appreciation. The future will not become sustainable by prediction. It will become sustainable by design and by the decisions we are willing to make today. May ICPIES 2026 help us make those decisions wisely, boldly, and together.

Professor Jagath Manatunge

Dean
Faculty of Engineering
University of Moratuwa

Messages from Conference Chairs: Prof. Bandunee Athapattu

It is my great pleasure to welcome you to the Proceedings of the 3rd International Conference on Plastics, Innovations, and Environmental Sustainability (ICPIES) 2026, held under the theme “Transformative Green Innovations for Environmental Sustainability, Ecosystem Resilience, and Social Wellbeing.” This conference provides a multidisciplinary platform for researchers, academics, policymakers, industry professionals, and environmental practitioners to share knowledge, exchange ideas, and explore innovative approaches to pressing environmental challenges.



The proceedings bring together diverse research contributions addressing key areas including plastic pollution, circular economy, sustainable materials, waste management and resource recovery, sustainability innovations, environmental governance, artificial intelligence and smart environmental monitoring, climate change, ecosystem resilience, and sustainable development. These contributions demonstrate the importance of integrated and innovative approaches to achieving long-term environmental sustainability.

I sincerely appreciate the valuable contributions of all authors, reviewers, scientific committee members, organizing committee members, partners, sponsors, and volunteers whose dedication has contributed to the success of ICPIES 2026. The diversity of expertise and perspectives represented at this conference highlights the importance of collaboration among academia, government, industry, and wider society in developing practical and transformative solutions.

I hope that the knowledge and ideas shared through these proceedings will inspire further research, innovation, collaboration, and meaningful environmental action. May ICPIES 2026 catalyze continued efforts towards a cleaner, more sustainable, resilient, and socially responsible future.

Professor Bandunee Athapattu

Professor in Environmental Engineering
Faculty of Engineering Technology
The Open University of Sri Lanka

Keynote Address 1: Beyond the Blueprint: Engineering Adoption in the Age of AI

In 2017, a viral image of an injured sea turtle convinced the world that plastic straws needed to disappear. Within two years, paper straws had replaced them almost everywhere. It was, by every visible measure, a solved problem. Then, in 2023, researchers at the University of Antwerp tested thirty-nine straw brands and found PFAS — persistent, potentially harmful "forever chemicals" — in ninety percent of the paper straws sampled. I open with this case not to relitigate straws, but because it is not an exception. This keynote names the pattern: the plastics field keeps solving the technical half of its problems and leaving the adoption half unexamined.



I argue that this pattern persists because we treat adoption as a communications problem rather than a design problem. When people choose cheap, disposable plastic over a better-engineered alternative, they are behaving rationally against the prices and defaults actually placed in front of them. Virgin plastic is inexpensive at the point of sale precisely because its downstream costs — marine cleanup, public health burden, a century in landfill — are never priced into that number. Convenience is not a failure of character. It is what remains once nobody has engineered the sustainable choice to compete on the terms people actually decide on: price, friction, and habit.

Kenya's 2017 plastic bag ban illustrates both the power and the limit of the conventional policy response. Backed by penalties of up to four years' imprisonment or fines approaching forty thousand US dollars, compliance rose from roughly eighty percent in 2019 to ninety-five percent by 2021, and measurable environmental recovery followed. Yet the legal biodegradable alternative cost roughly six times more than the banned bags it replaced, and years later, traders in Nairobi's poorest settlements were still documented using them — not from defiance, but because the legal option was priced for a different customer. Kenya did not change fifty million minds; it changed the arithmetic of noncompliance for those who could afford the change. That is not a criticism of the policy. It is evidence for my argument.

Norway offers the contrasting model. Its bottle deposit system — a small refundable deposit redeemed at thousands of reverse vending machines, backed by a producer tax that falls as national return rates rise — has achieved a plastic bottle recycling rate of ninety-seven percent, a decade ahead of the European Union's own 2029 target. Nobody ran a persuasion campaign. Norway engineered the path of least resistance until the sustainable choice

became the automatic one. The lesson generalizes well beyond bottles: adoption follows system design far more reliably than it follows moral appeal.

My central claim is that choice architecture — the deliberate design of defaults, friction, and feedback that shapes behavior — belongs inside engineering practice, not outside it as an afterthought for marketing or policy to solve later. What makes this newly tractable, at a scale plastics engineering has never had, is artificial intelligence. The same systems that already run continuous, adaptive experiments to convert attention into consumption — dynamic pricing, personalized recommendation, incentive tuning — can be redirected toward adoption itself: testing, in real time and at population scale, what actually gets a community to keep using a reusable system rather than reach for the cheaper, disposable one. Through our AEGIS program, we have piloted exactly this model, pairing founders and engineering teams with AI systems that compress months of adoption experimentation into weeks.

I make this argument directly to the university administrators and policymakers reading this abstract, because the gap I describe is, in the end, an institutional one. Engineering curricula across this region train students to optimize materials and processes; almost none train them to design for adoption. I propose a concrete, low-risk first step: a one-semester pilot pairing final-year engineering teams with AI-augmented adoption-design tools under the AEGIS methodology, applied to a live local SME or circular-economy challenge chosen by the participating faculty. Every year this layer remains absent from the curriculum is another year in which well-engineered alternatives are built, launched, celebrated, and quietly abandoned, exactly as paper straws were. The technology to close this gap now exists. What is missing is the institutional decision to teach it.

Prof. Alex Lin

Director - Jirafe World

Co-author of “The Digital Solopreneur Handbook” (World Scientific)

Keynote Address 02: Advancing Sustainable and Resilient Development through Integrated Environmental Management

It is great pleasure that I deliver my keynote to the ICPIES 2026. I would also like to express my sincere appreciation to the organizing committee, the Open University of Sri Lanka, and the University of Moratuwa for inviting JICA to be part of this important conference.

ICPIES has become a valuable platform that brings together researchers, policymakers, industry leaders, environmental practitioners, and young innovators from around the world to explore solutions for some of the most pressing challenges facing humanity today. So, the theme including the agenda settings of the conference for this year could not be more timely.



The agendas on plastic pollution, climate change, biodiversity loss, and resource depletion are no longer isolated environmental concerns. They are interconnected challenges that directly affect our economies, public health, food security, and social wellbeing. In this sense, we need to consider how effectively we can collaborate across sectors and how inclusively we can ensure benefits for all communities.

JICA, as a development partner, believes that sustainable growth is achieved through investment infrastructure properly and capacity development for institutions and human resources. At the global level, in 2021, JICA launched “JICA Clean City Initiative” for the contribution to cleaner and healthier urban development for 500 million people in 50 countries by 2030. The initiative under being promoted through JICA’s technical and financial assistances, research partnership is rooted in Japan’s own experience and lessons learned of overcoming environmental pollution in the past. As the outcome during first five years, the JICA’s initiative has expanded to approximately 67 countries and reached 350 million people in foreign countries.

For sustainable environment including plastic and waste management in Sri Lanka, JICA currently plays pivotal cooperation such as Formulating Western Province Solid Waste Management Master Plan, and technical cooperation for Plastic Management Capacity Development. The Master Plan has been approved by the Cabinet in 2025 and would be the Key Driving Force not only for reducing the volume of wastes but also creating new economic opportunities and green jobs in Sri Lanka. The technical cooperation for plastic management would support setting up reliable and comprehensive data foundations and simultaneously contributing to organizing action plans for key priority areas including

Packaging plastic waste and single use plastic waste as well as Plastic Management Centre establishment.

The future we seek is one where economic prosperity, environmental stewardship, and social wellbeing reinforce one another. Achieving that future will require courage, innovation, collaboration, and above all, a shared sense of responsibility. JICA remains committed to working with the Government and people of Sri Lanka, as well as with academia, industry, civil society, and international partners, to advance sustainable and resilient development.

Let us work together to build cleaner cities, healthier communities, and a more sustainable future in Sri Lanka for generations to come.

Mr. Shigeo Honzu

Chief Representative,
JICA Sri Lanka Office

Plastic Pollution and Impacts: Microplastics in Terrestrial and Marine Ecosystems