



THE 12TH ASIA-PACIFIC LANDFILL SYMPOSIUM

In Association With
AUN/SEED-Net Regional Conference



12 - 14 NOVEMBER 2024
KUALA LUMPUR, MALAYSIA

CONFERENCE **X** FORUM **X** WORKSHOP
EXHIBITION **X** TECHNICAL TOUR

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FOREWORD BY THE DEAN OF MALAYSIA-JAPAN INTERNATIONAL INSTITUTE OF TECHNOLOGY (MJIT), UNIVERSITI TEKNOLOGI MALAYSIA

It is with great pride and anticipation that we welcome you to the 12th Asia Pacific Landfill Symposium in Association with the AUN/SEED-Net Regional Conference (APLAS) 2024, hosted by the Malaysia-Japan International Institute of Technology (MJIT), Universiti Teknologi Malaysia (UTM). This esteemed event has evolved into a significant platform where academics, industry leaders, policymakers, and practitioners converge to address critical waste management issues in the Asia-Pacific region. As we explore this year's theme, "Waste 2 X", we seek innovative solutions to maximize resource utilization and transform waste into valuable products through various circular economy pathways.

MJIT, in partnership with NPO-LSA Japan, is honoured to play a role in fostering knowledge exchange and facilitating collaboration between diverse stakeholders. This year's symposium promises a robust agenda, with topics ranging from sustainable landfill practices, advanced recycling technologies, to waste-to-energy strategies, addressing both regional and global sustainability concerns. We are particularly excited to engage in insightful discussions on sustainable waste transformation and the pressing challenges in waste management across the Asia-Pacific.

I extend my gratitude to the organizing committee, our esteemed speakers, and all participants. Your contributions are invaluable in driving forward our shared vision for a sustainable future. May this symposium inspire meaningful dialogue, foster lasting partnerships, and contribute to a more resilient and resource-efficient society.

With warm regards,

Assoc. Prof. Ts. Ir. Dr. Nurulakmar Abu Husain
Dean,
Malaysia-Japan International Institute of Technology
Universiti Teknologi Malaysia

APLAS
KUALA LUMPUR 2024
**THE 12TH ASIA-PACIFIC
LANDFILL SYMPOSIUM**
In Association With
AUN/SEED-Net Regional Conference



FOREWORD BY THE CHAIR OF THE ORGANISING COMMITTEE

On behalf of the organizing committee, it is a privilege to welcome you to the 12th Asia Pacific Landfill Symposium in Association with the AUN/SEED-Net Regional Conference (APLAS) 2024. This symposium, themed “Waste 2 X”, highlights our commitment to pioneering waste solutions that extend beyond disposal. This year’s discussions will examine the transformative potential of waste in advancing the circular economy, emphasizing a transition where waste serves as a resource for creating new materials, energy, and economic opportunities.

APLAS has established itself as a cornerstone event for exchanging cutting-edge knowledge on sustainable waste management practices across the Asia-Pacific region. This year’s program is tailored to address critical topics, from landfill technology innovations, waste management strategies to policies supporting circular waste solutions. We are proud to provide this platform where insights and expertise from global thought leaders, including distinguished speakers from Malaysia, Japan and beyond.

I would like to thank NPO LSA for the trust in handing the baton to MJIT-UTM to host the APLAS 2024 and all our collaborators, sponsors, and participants, whose dedication to sustainable development makes this event possible.

Let us collectively embrace the challenge of reimagining waste and working towards building a sustainable future. We look forward to productive discussions, meaningful collaborations and networking during APLAS 2024.

Warm regards,

Ts. Dr. Pramila Tamunaidu
Chair, APLAS 2024



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Foreword by The Chair of
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The background of the entire page is a faded, high-angle photograph of the Kuala Lumpur skyline. The Petronas Twin Towers are the most prominent feature in the center. Other skyscrapers and the Kuala Lumpur Tower are visible to the right. In the foreground, there are several large, modern multi-story buildings with blue and white facades, and some greenery.

PROGRAM TENTATIVE

PROGRAMME

*Programme is subject to changes by organiser

DAY 1 (12 NOVEMBER 2024)

| | |
|---------------------|--|
| 8.00 am – 8.30 pm | OPENING SESSION Venue: Grand Hall |
| 8.00 am – 8.45 am | Registration |
| 8.50 am – 8.55 am | National Anthem: Negaraku Doa Recital |
| 8.55 am – 9.10 am | <u>Welcoming Remarks</u> By Prof Ts Dr Ali Selamat, Deputy Vice Chancellor of Universiti Teknologi Malaysia By Prof. Dr. Kazuei Ishii, President of NPO-LSA, Japan By His Excellency Noriyuki Shikata, Ambassador- Designate of Japan to Malaysia |
| 9.10 am – 9.20 am | <u>Launching of APLAS 2024</u> By Yang Berhormat Datuk Wira M Noor Azman Taib, Secretary General, Ministry of Housing & Local Government, Malaysia |
| 9.20 am – 9.30 am | Launching Gimmick & Montage Souvenir Presentation Group Photo Session |
| 9.30 am – 10.00 am | <u>Keynote 1: Waste Management and Circular Economy Policy in Japan</u> By Mr. Ko Matsuura, Assistant Director, Office for Promotion of Sound Material-Cycle Society, Environmental Regeneration and Material Cycles Bureau, Ministry of the Environment, Japan |
| 10.00 am – 10.30 am | <u>Keynote 2: Solid waste management in Malaysia: What's Up?</u> By Mr. Zamri Abdul Rahman, Research & Technical Committee Head of Waste Management Association of Malaysia |
| 10.30 am – 11.00 am | <u>Keynote 3: Perspective on the Role of Landfill Sites in the Circular Economy</u> By Prof. Dr. Kazuei Ishii, President of NPO-LSA, Japan |
| 11.00 am – 11.30 am | Exhibition Visit & Morning Tea Break |
| 11.30 am – 12.00 pm | <u>Keynote 4: Municipal Staff Shortage for Disaster Waste Disposal (Online)</u> By Mr. Kazuyuki Numata, Deputy Director of the Environment Bureau, Sendai City, Japan |
| 12.00 pm– 12.30 pm | <u>Keynote 5: JICA Global Waste Management Projects</u> By Mr. Yamamoto Tadayo, Senior Advisor of Global Environment Department, Japan International Cooperation Agency (JICA) |

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| 12.30 pm – 1.00 pm | <p><u>Keynote 6: Five-Year Review (FYR) of Klity Creek Rehabilitation and Secure Landfill of Tailing Waste</u></p> <p>By Prof. Emerit. Dr. Thares Srisatit, Honorary Advisor, Environmental Engineering Association of Thailand (EEAT), Thailand</p> |
| 1.00 pm – 2.00 pm | <i>Exhibition Visit & Lunch</i> |
| 2.00 pm – 3.40 pm | <p>BUSINESS EXPERTS' SESSION</p> <p><i>Venue: Grand Hall</i></p> |
| 2.00 pm – 2.10 pm | <p><i>Introduction to Business Experts' Session</i></p> <p>Session Chair: Mr. Fumiyoshi Ohno, Chair of International Committee NPO-LSA, Japan Co-Chair: Dr. Farah Liana Mohd Redzuan, Sponsorship Chair APLAS 2024</p> |
| 2.10 pm – 2.25 pm | <p><i>B2B Expert Sharing 1: Introduction of Kanadevia Technology for People and Planet</i></p> <p>By Mr. Keiji Aota Senior Manager, Water Treatment Design & Engineering Department, Kanadevia Corporation, Japan</p> |
| 2.25 pm – 2.40 pm | <p><i>B2B Expert Sharing 2: Recycling and Challenges of Aging Society in Japan</i></p> <p>By Ms. Tomoe Kumagai, Consultant, EX Research Institute, Japan</p> |
| 2.40 pm – 2.55 pm | <p><i>B2B Expert Sharing 3: Innovative Construction Practices and Solutions for Circular Economy Integration: Global Insights and Local Applications</i></p> <p>By Dr. Jovana Husemann, Head of Sustainability and Strategic Business Development, Naue Group, Germany</p> |
| 2.55 pm – 3.10 pm | <p><i>B2B Expert Sharing 4: Disaster Waste Estimation and Treatment</i></p> <p>By Mr. Ganiev Jakhongirbek, Expert, Civil Engineering Department, Okumura Corporation, Japan</p> |
| 3.10 pm – 3.25 pm | <p><i>B2B Expert Sharing 5: Geomembrane Technology</i></p> <p>By Mr. Iba Michio, Manager, Construction Materials Department, Mitsuboshi Belting Ltd., Japan</p> |
| 3.25 pm – 3.40 pm | <p><i>B2B Expert Sharing 6: Nippon Koei's Consulting Services in Solid Waste Management (SWM) Sector</i></p> <p>By Mr. Koki Takano, Circular Economy Promotion Department, Nippon Koei Co., Ltd., Japan</p> |
| 3.40 pm – 4.10 pm | <i>Exhibition Visit & Tea Break</i> |
| 4.15 pm – 6.00 pm | <p>EVENING PARALLEL SESSION</p> <p><i>Venue: Gallery 1, Gallery 2</i></p> |

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| <p>4.15 pm – 6.00 pm</p> | <p align="center">Parallel Session 1: Sustainable Waste Management Strategies Venue: Gallery 1</p> <p>Session Chair: Dr. Abhisit Bhatsada, King Mongkut's University of Technology Thonburi (KMUTT) Session Co-Chair: Mr. Muhammad Bukhari Rosly, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 1: Modelling the Low Heating Value of Bio-Dried Refuse-Derived Fuel and Advancing Sustainable Waste Management through Enhanced Energy Recovery By Abhisit Bhatsada, Komsilp Wangyao, Tanik Itsarathorn • Evaluation and Willingness to Pay for Household Hazardous Waste Management in a District of Bandung City By Mochammad Chaerul, Nadya Husna Nuralfiya • Incentivizing Waste Management: Results-Based Scheme in Selected Barangays within the Five Drainage Areas in Metro Manila, Philippines By Anne Louise T. Tolesa, Kristine Ann M. Luna, Guinevere S. Constantino, Reynaldo R. Medina • Stratified Sampling Enhanced by Remote Sensing Product Data: An Approach for Solid Waste Project and Research Surveys By Elprida Agustina, Emenda Sembiring, Anjar Dimara Sakti • The Current Situation of the Liquid-Bio Fertilizer Supply Chain from Feedstock to Application to Farms By Shun Otsuka, Kazuei Ishii, Satoru Ochiai, Geun-Yong Ham, Jumana Al-Mallahi |
| | <p align="center">Parallel Session 2: Circular Economy in Waste Management Venue: Gallery 2</p> <p>Session Chair: Prof. Dr. Emenda Sembiring, Institute Teknologi Bandung (ITB) Session Co-Chair: Ms. Nurhamieza Md Huzir, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 2: Current State of Solid Waste Management Access for Circular Economy Readiness By Emenda Sembiring • The Development of a Sustainable End-of-Life Vehicle Processing Operation in Kiribati By Alice Leney, Gerdi Raimon • Study on Recycling of By-product Salt by Bipolar Membrane Electrodialysis Device By Jiaxing Liu, Lingjie Yu, Kazuo Tameda, Sotaro Higuchi • Circular Economy of PET Bottles in Malaysia through Life Cycle Assessment By Bryan Wei Ren Wah, Liew Peng Yen, Takeshi Mizunoya, Lian See Tan, Helmut Yabar |

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| | <ul style="list-style-type: none"> • Solid Wastes Management of Monastery by Circular Economy By Wanpen Wirojanagud, Mayuree Teyarachaakul, Pitsanu Pannaracha, Torpong Kreetachart • Benefit-Cost Analysis for Plastic Waste Treatment Using Modular Pyrolysis Technology in Rural Areas of Bali Province By Benno Rahardyan, M Syams Apriandas Harli |
| 6.00 pm | End of Day 1 |
| 6.00 pm – 8.30 pm | Networking Dinner |

| DAY 1 (12 NOVEMBER 2024) | |
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| <i>Tentative Programme for Networking Dinner</i> | |
| 6.00 PM – 8.30 pm | NETWORKING DINNER <i>Venue: Grand Hall</i> |
| 6.00 pm – 6.30 pm | Arrival of Guest of Honours |
| 6.30 pm – 6.35 pm | <u>Welcome Speech</u> By Assoc. Prof. Ir. Dr. Nurulakmar Abu Husain, Dean, Malaysia-Japan International Institute of Technology (MJIT), Universiti Teknologi Malaysia |
| 6.35 pm – 6.40 pm | <u>Cultural Presentation of Silat by Pentas MJIT</u> |
| 6.40 pm – 6.50 pm | <u>Awards Presentation & Token of Appreciation for Sponsors</u> By Assoc. Prof. Ir. Dr. Nurulakmar Abu Husain <u>APLAS 2026 Handover Ceremony</u> Kuala Lumpur to Sapporo <u>Acceptance Speech</u> By Prof. Dr. Kazuei Ishii, President, NPO-LSA Japan |
| 6.50 pm – 8.30 pm | Dinner & Performance by Pentas MJIT |

*Programme is subject to changes by organiser

| PROGRAMME | |
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| *Programme is subject to changes by organiser | |
| DAY 2 (13 NOVEMBER 2024) | |
| 8.30 am – 11.00 pm | OPENING SESSION <i>Venue: Grand Hall</i> |
| 8.00 am – 8.50 am | Registration |
| 8.50 am – 9.00 am | <u>Opening Remarks</u> By Ts. Dr. Abd Halim Md Ali, Co-Chair of APLAS 2024 By Mr. Hideki Shimazu, JICA Expert, AUN-Seed Net Secretariat |

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| 9.00 am – 10.30 am | <p><u>Special Session: Science-Technology-Innovation Coordination Platform</u></p> <p>Moderator:</p> <p>Ts. Dr. Ruwaida Jamian, Registration Chair APLAS 2024</p> <p>Speakers:</p> <ol style="list-style-type: none"> 1) Dr. Taro Sonobe, STI Coordinator, Japan-ASEAN Science, Technology and Innovation 2) Mr. Hideki Shimazu, JICA Expert, AUN-Seed Net Secretariat 3) Ms. Emi Kaneko, Director at Japan Science and Technology Agency, Singapore 4) Mr. Yoshitaka Inagaki, Senior Representative, JICA Malaysia 5) Invited Malaysian Agencies <p><u>SATREPS Project</u></p> <p>Success Story: Ts. Dr. Sathiabama T Thirugnana, UTM OTEC</p> |
| 10.30 am – 11.00 am | Exhibition Visit & Morning Tea Break |
| 11.00 am – 1.00 pm | <p>MORNING PARALLEL SESSION</p> <p>Venue: Grand Hall, Gallery 1, Gallery 2</p> |
| 11.00 am – 1.00 pm | <p>Parallel Session 3: Innovative Approaches to Sustainable Landfilling</p> <p>Venue: Grand Hall</p> <p>Session Chair: Assoc. Prof. Dr. Liew Peng Yen, Universiti Teknologi Malaysia (UTM)</p> <p>Session Co-Chair: Dr. Hafizah Farhah Saipan@Saipol, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 3: Neutralization of Landfilled Incinerator Ash Layer Using High Carbon Dioxide Dissolved Solution and Crystal Growth on the Surface of Incinerator Ash Particles By Kentaro Miyawaki, Haruyuki Fukai and Ayana Matsumoto • Study on Early Stabilization of Sea Surface Landfill by Airlift Pump Method By Lingjie Yu, Kazuo Tameda, Jiaying Liu, Shigematsu Mikiji, Sotaro Higuchi • Instructions Manual for Final Disposal Site Maintenance By Fumiyoshi Ohno, Isamu Norimatsu and Kazuei Ishii, Tomoe Kumagai • Maintaining Stability of Landfill using Geosynthetics to Reduce Geo-risk Towards Community Intan Nor Zuliana Baharuddin and Christian Nieheus • Surface Temperature of Different Geomembranes Under Hot Climate in Malaysia and Their Significance Landfill Liner Design and Installation Noor Hafizah Abdul Halim, Colin Lim and Hermann Ng |

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| | <p>Parallel Session 4: Waste Transformation and Valorization Technologies Venue: Room 1</p> <p>Session Chair: Assoc. Prof. Dr. Komsilp Wangyao, King Mongkut's University of Technology Thonburi (KMUTT) Session Co-Chair: Dr. Ahmad Faiz Mohammad, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> Invited 4: Influence of Temperature Evolution on Moisture Removal Efficiency During Wet-Refuse-Derived Fuel Production: Experimental Insights for Process Optimization and Scaling By Komsilp Wangyao, Abhisit Bhatsada, Panida Payomthip, Eka Wahyanti, Tanik Itsarathorn, Ye Nyi Nyi Lwin Characterization of Sustainable Graphitic Carbon from Food Waste via Microwave Irradiation Technique By Nuraqilah Hishammuddin, Siti Shawalliah Idris, Norazah Abd Rahman, Noor Fitrah Abu Bakar, Siti Norazian Ismail, Alina Rayahu Mohamed, Nur Hidayati Othman Sustainable Biodiesel Production from Waste Cooking Oil Using Diatomite as a Catalyst Nurhamieza Md Huzir, Pramila Tamunaidu, Yogeswary Vadivelu, Muhammad Bukhari Rosly, Azlan Nur Rasyid Amin Effect of Aluminosilicate-Based Additives on the Physicochemical Properties of Palm Fiber and Shell Ash By Muhammad Afiq Daniel Azmi, Nor Ruwaida Jamian, Abd Halim Md Ali, Khairunnisa Mohd Paad, Vekes Balasundram, Dewika M., Ammar Mohd Rashid, Mohd Rashid Mohd Yusof Green Waste-Synthesized Gold Nanoparticles/ Nanofluid for Solar Harvesting Technology By Siti Rahmah Aid, Eleen Dayana Mohamed Isa, Yutaka Asako, Ooi Chia Yee Development of Durable Superhydrophobic Coatings with Enhanced Surface Roughness for Carbon Steel Substrates By Nurul Nabila Mohd Din, Norhasnidawani Johari, Mohd Aidy Faizal Johari, Noor Azlina Hassan, Abd Halim Md Ali, Rizal Arifin |
| | <p>Parallel Session 5: Innovative Waste Treatment and Disposal Venue: Gallery 2</p> <p>Session Chair: Dr. Geun-Yong Ham, Hokkaido University (HU) Session Co-Chair: Dr. Farah Liana Mohd Redzuan, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> Invited 5: Estimating the Allowable High Loading of Waste Products to Anaerobic Digestion for Food Waste By Geun-Yong Ham, Taichi Endo, Kazuei Ishii, Satoru Ochiai |

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| | <ul style="list-style-type: none"> • Comparative Analysis of Heat Balance Models in the Solar Greenhouse Biodrying System By Katitep Ngamket, Kazuei Ishii, Geun-Yong Ham, Satoru Ochiai • Rubber Seed Shell Based Activated Carbon as Potential Biosorbent for the Removal of Heavy Metals from Aqueous Solution By Muhammad Bukhari Rosly, Nomie Marini binti Aminallah, Abd Halim Md Ali, Muhammad Hazwan Hamzah, Ahmad Hazwan Azhari, Shahirah Shamsulbahrin, Mohamad Akmal Abdul Rahim • Conversion of Oil Palm By-Products as Carrier Materials in Expanded Bed Process By Wai Loan Liew, Mohd Azraai Kassim, Khalida Muda, Soh Kheang Loh, Nur Syamimi Zaidi • Co-Pyrolysis of EFB and UPCO over Nickel Oxide Loaded HZSM-5: A Comparative Co-Pyrolysis Study via Thermogravimetric Analyser and Fixed-Bed Reactor By Vekes Balasundram, Norhuda Abdul Manaf, Norazana Ibrahim, Ruzinah Isha, Suchithra Thangalazhy Gopakumar, Le Kim Hoang Pham • UAV Photogrammetry in Waste Disposal: Evaluating Density and Capacity Expansion By Parichat Suknark, Sirintornthep Towprayoon, Sompote Youwai, Chart Chiemchaisri, Komsilp Wangyao |
| 1.00 pm – 2.00 pm | Exhibition Visit & Lunch |
| 2.00 pm – 3.30 pm | AFTERNOON PARALLEL SESSION Venue: Grand Hall, Gallery 1, Gallery 2 |
| 2.00 pm – 3.30 pm | <p>Parallel Session 6: Island Waste Management Venue: Grand Hall</p> <p>Session Chair: Ir. Ts. Dr. Norhasnidawani Johari, Universiti Teknologi Malaysia (UTM) Session Co-Chair: Dr. Liew Wai Loan, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 6: Development of a Waste Management Authority for Kiribati By Gerdi Raimon, Alice Leney • Technical Cooperation on Waste Management in the Pacific Region By Soeda Shungo • Rehabilitation, Monitoring and Extension of Landfills in an Atoll Environment By Alice Leney, Harry Langle • Study on the Quantitative Analysis of the Work-Loads in Waste Hand-Sorting By Satoru Ochiai, Guen-Yong Ham, Kazuei Ishii, Toru Furuichi |

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| | <ul style="list-style-type: none"> • The Waste Landfill Data Collection and Management Using the Kobo toolbox Application – Pacific Islands Case Study By Faafetai Sagapolutele Uitime |
| | <p style="text-align: center;">Parallel Session 7: Environmental Assessment in Waste Management Venue: Room 1</p> <p>Session Chair: Assoc. Prof. Dr. Benno Rahardyan, Institut Teknologi Bandung (ITB) Session Co-Chair: Ts. Dr. Nor Ruwaida Jamian, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 7: Study of Bandung City Food Waste Global Warming Potential By Benno Rahardyan, Nada Zharfania Zuhaira, Yeggi Darnas, I Made Wahyu Widyarsana • Integrating Environmental Risk Assessment and Integrated Risk-Based Approach in Landfill Risk Evaluation By Tuani Lidiawati Simangunsong, Indah Rachmatiah Siti Salami, I Made Wahyu Widyarsana • Environmental Risk Assessment of Sarimukti Waste Landfill Postfire in Indonesia By I Made Wahyu Widyarsana, Nisrina Maulidya • Impact of Runoff, Wind, and Floods on the Macroplastic Mobilization Terrestrial Environment: Systematic Review By Attar Hikmahtiar Ramadan, Emenda Sembiring, Benno Rahardyan, Hadi Kardhana • Evaluation of Waste Management Due the Mount Merapi Cold Lava Flash Flood Disaster in Agam Regency (Case Study in the Affected Sub-Districts) By Gusrin Sudirja Pasaribu, Benno Rahardyan |
| | <p style="text-align: center;">Parallel Session 8: Community-Based Waste Management Venue: Gallery 2</p> <p>Session Chair: Dr. Kristine Ann Martinez Luna, Woodfields Consultants, Inc. Session Co-Chair: Dr. Siti Rahmah Aid, Universiti Teknologi Malaysia (UTM)</p> <ul style="list-style-type: none"> • Invited 8: Women in Action: The Role of Women in Sustainable Solid Waste Management in Metro Manila, Philippines By Kristine Ann M. Luna, Anne Louise T. Tolesa, Guinevere S. Constantino, Reynaldo R. Medina • Waste Management Behavior in Indonesia: A Systematic Review By Yebi Yuriandala, Emenda Sembiring, Benno Rahardyan • Designing Targeted Behaviour Change Program by Utilizing Barrier Analysis of Household Waste Segregation Behaviour in Urban Jakarta. Comparison between: PHINLA Project in East-North Jakarta and Kepulauan Seribu By Franz Sinaga, Theo F Manurung, Alfa Miranti Kuntaryo, Wingky Vikri Saputri |

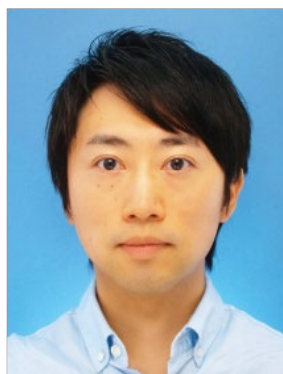
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| | <ul style="list-style-type: none"> • Evaluating Single-Use Plastic-Free Market Campaigns: A Case Study of Pasar Awam Taman Universiti, Johor Bahru By Muhamad Safwan Ishak, Mohamad Fauzi Ahmad, Wan Nurul Mardiah Wan Mohd Rani, Jamalia Mohd Marsin, Abdullah Hisam Omar • Reaching Inaccessible Communities: Proposed Community-Based Solid Waste Management Sub-System in Metro Manila, Philippines By Guinevere S. Constantino, Kristine Ann M. Luna, Anne Louise T. Toleza, Reynaldo R. Medina |
| 3.30 pm – 4.00 pm | Exhibition Visit & Tea Break |
| 4.00 pm – 5.00 pm | CLOSING SESSION Venue: Grand Hall |
| 4.00 pm – 5.00 pm | Awards & Closing Ceremony <u>Best Presentation Awards</u> By Assoc. Prof. Ir. Dr. Nurulakmar Abu Husain, Dean, Malaysia-Japan International Institute of Technology (MJIT), Universiti Teknologi Malaysia <u>Closing Remarks</u> Thank you from Dr Pramila Tamunaidu, Chair of APLAS 2024 |
| 5.00 pm | End of Day 2 |

| PROGRAMME | |
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| *Programme is subject to changes by organiser | |
| DAY 3 (14 NOVEMBER 2024) | |
| Tentative Programme for Technical Visit | |
| 8.30 am – 3.00 pm | Technical Visit Venue: FIKS Putrajaya |
| 8.30 am – 9.00 pm | Registration |
| 9.00 am – 12.00 pm | Technical Visit to Fasiliti Inovasi Kitar Semula (FIKS), Putrajaya |
| 12.00 pm – 2.00 pm | Lunch |
| 3.00 pm | End of Day 3 |

*Programme is subject to changes by organiser

KEYNOTE SPEAKERS

KEYNOTE 1



Mr. Ko Matsuura

Assistant Director, Office for Promotion of Sound Material-Cycle Society, Environmental Regeneration and Material Cycles Bureau, Ministry of the Environment, Japan

Title of Keynote Speech

Waste Management and Circular Economy Policy in Japan

Background Information

After having several years of experience in environmental management for the construction field in the private sector, he has had almost 10 years of experience in the public sector in the fields of national and international environmental policy and project management, such as Environmental Impact Assessment (EIA), air environment management, co-benefits (climate and air), waste management and circular economy, as well as international negotiations including G7, G20, the United Nations Environment Assembly (UNEA), the Japan-ASEAN Cooperation, and the Acid Deposition Monitoring Network in East Asia (EANET).

At his current position, his role is mainly to promote both bilateral and multilateral international cooperation, including through waste management and circular economy policy, 3R, and circular infrastructure, especially waste-to-energy technology. Through his leadership and dedication, he continues to play a pivotal role in shaping environmental policies and fostering international collaboration to address pressing environmental challenges.

KEYNOTE 2



Mr. Zamri Abdul Rahman

Research & Technical Committee Head of Waste Management Association of Malaysia

Title of Keynote Speech

Solid Waste Management in Malaysia: What's Up?

Background Information

Mr. Zamri Abdul Rahman serves as the Chair of the Technical & Research Committee at the Waste Management Association of Malaysia (WMAM). He is currently the Director, Waste Management, Environment and Sustainability at Aurecon Lestari Sdn Bhd. Prior to this, he was the Chief Operating Officer at Worldwide Holdings Bhd. Mr Zamri has 34 years of working experience in solid waste management, water and wastewater treatment and renewable energy.

He has an MSc in Environmental Engineering from Universiti Teknologi MARA (UiTM), Malaysia and a BSc in Civil & Environmental Engineering from University of Wisconsin-Madison, USA. His current and immediate past projects are as Circular Economy advisory panel, actively involved in Waste-to-Energy project developments and water treatment projects.

Recently, he played an important role as a consultant for the Circular Economy Blueprint for Solid Waste in Malaysia (2025-2035) as well as Scheduled Waste Circular Economy Feasibility and Masterplan study.

KEYNOTE 3



Professor Kazuei Ishii

President of The Landfill Systems & Technologies Research Association of Japan, NPO
(NPO·LSA)

Title of Keynote Speech

Perspective on the Role of Landfill Sites in The Circular Economy

Background Information

Professor Kazuei Ishii is a professor at Faculty of Engineering, Hokkaido University in Japan. He obtained his Bachelor's degree in Sanitary Engineering from Hokkaido University in 1993, followed by a Master's degree in the same discipline in 1995. In 2004, he earned his Doctorate in Engineering, further advancing his expertise in environmental engineering. He is widely recognized for his expertise with particular emphasis on waste management, soil and groundwater contamination remediation, and the development of sustainable biomass recycling systems. His academic contributions extend beyond research into teaching, where he has mentored numerous students and young professionals in the field.

A committed leader, Professor Ishii is actively involved in several professional organizations, having served as the Director of the Japan Society of Material Cycles and Waste Management. Through his extensive research, leadership, and educational endeavours, he has significantly advanced the field of environmental engineering and continues to be a key influence in shaping the future of waste management and environmental sustainability.

KEYNOTE 4



Mr. Kazuyuki Numata

Deputy Director of the Environment Bureau in Sendai City, Japan

Title of Keynote Speech

Municipal Staff Shortage for Disaster Waste Disposal (Online)

Background Information

Mr. Kazuyuki Numata currently serves as the Deputy Director of the Environment Bureau in Sendai City, Japan. He joined the Sendai City Government in 1993.

During the Great East Japan Earthquake in March 2011, he served as the chief of the disaster waste management section, where he was involved in the demolition of damaged houses. Subsequently, he held positions such as the section chief in charge of supporting the Third United Nations World Conference on Disaster Risk Reduction held in Sendai in 2015, the director of the Health and Safety Section of the Health Center, and the director of the Waste Management Department.

In 2023, he assumed his current position as Deputy Director General and Director of Resource Circulation Department at the Sendai City Environmental Bureau.

KEYNOTE 5



Mr. Yamamoto Tadayo

Senior Advisor of Global Environment Department, Japan International Cooperation Agency

Title of Keynote Speech

JICA Global Waste Management Projects

Background Information

Mr. Tadayo Yamamoto is a Senior Advisor in the Global Environment Department at Japan International Cooperation Agency (JICA). He has over 30 years working in JICA's technical cooperation projects in Waste Management. He plays a crucial role in providing strategic guidance for environmental projects with a focus on sustainable development and environmental conservation.

He has a Civil Engineering Degree from Waseda University Japan and Master of Science from Manchester University in Great Britain.

With a strong background in waste management and environmental sustainability, Mr. Yamamoto has led several key initiatives, particularly in solid waste management. Yamamoto's work contributes to implementing sustainable practices through technical cooperation and partnerships across Asia and other developing regions.

KEYNOTE 6



Professor Emeritus Dr. Thares Srisatit

Honorary Advisor, Environmental Engineering Association of Thailand

Title of Keynote Speech

Five-Year Review (FYR) of Klity Creek Rehabilitation and Secure Landfill of Tailing Waste

Background Information

Professor Emeritus Dr. Thares Srisatit is a highly respected figure in the field of environmental engineering, both in Thailand and internationally. With a distinguished career spanning decade, he has made significant contributions to advancing environmental sustainability, waste management, and pollution control. He is an esteemed Honorary Advisor to the Environmental Engineering Association of Thailand (EEAT), where his strategic guidance continues to shape the country's approach to environmental challenges.

Dr. Thares earned his academic credentials in engineering from Chulalongkorn University, where he also served as a professor in the Department of Environmental Engineering. His work at the university laid the foundation for many of the key environmental policies and research advancements in Thailand. As a thought leader in environmental engineering, Professor Emeritus Dr. Thares continues to be an influential voice, actively participating in international collaborations, advising governments and institutions, and contributing to global dialogues on sustainability and environmental preservation.

ABSTRACTS

**Parallel Session 1 :
Sustainable Waste
Management Strategies**

Modelling the Low Heating Value of Bio-Dried Refuse-Derived Fuel and Advancing Sustainable Waste Management through Enhanced Energy Recovery

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Abstract

The effective utilization of substandard refuse-derived fuel (RDF) through biodrying technology is crucial for advancing the circular economy and sustainable waste management. This study models the final low heating value (LHV) of biodried RDF using a multiple regression approach based on data from 63 batches across 21 experiments. Each experiment used a 0.5 x 0.5 with 1.2 m high wet-RDF layers, and a 5-day operation, with varying aeration rates (0.2-0.8 m³/kg/day), initial organic content (18-30%), and initial moisture content (40-60%). The results revealed that the final LHV is significantly influenced by the initial LHV, elemental composition, and initial moisture content, with a 95% confidence level. Specifically, increases in initial LHV and the carbon content of organic material resulted in increases in final LHV by 0.474 and 172.522 units, respectively, while an increase in the organic material led to a decrease in final LHV by 167.071 units. Additionally, a 41.534% rise in initial moisture content introduced a 2% inaccuracy in predicting the final LHV. Enhancing energy recovery from substandard materials supports the establishment of more sustainable waste management practices. This study demonstrates the efficacy of advanced statistical methods in managing variability across batch operations and provides a reliable model for optimizing final LHV estimation in biodrying processes.

Keywords: Biodrying; refuse-derived fuel; low heating value; organic content

Evaluation and Willingness to Pay for Household Hazardous Waste Management in a District of Bandung City

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Abstract

Activities in a household potentially generate various types of waste which are classified as general and hazardous wastes. Like other cities in Indonesia, the municipality of Bandung City's focus is only on general waste management. The study aims to reveal the management of hazardous waste generated from household in Rancaekek District of Bandung City, and then evaluate it using SWOT analysis and provide the community's willingness to pay to improve the management of household hazardous waste (HHW). The methods used included detailed observation in the field, questionnaire, and interview with 100 households as respondents from a total 88.145 population in the district. Currently, there was no separation between general waste and HHW at source and the two were mixed in collection and transportation means and ultimately accumulated in temporary storage (TPS) and final disposal sites. From visual observation at TPS, HHW was predominantly generated by various packaging and sachets of hazardous materials for home care and personal care products, used batteries and lamps, diapers etc. Respondents predominantly showed quite negative responses such as not doing anything to reduce waste at the source (83%) and waste segregation (73%). Through SWOT analysis, HHW management could be improved by separating it from the general one. The improvement of HHW management was supported by willingness to pay from the majority of respondents (82%) with a minimum and maximum montly of 1.0 and 2.7 US\$, respectively with a median of 1.34 US\$. The municipality must increase public awareness by promoting the importance of better management of HHW.

Keywords: Evaluation; household hazardous waste; SWOT analysis; willingness to pay

Incentivizing Waste Management: Results-Based Scheme in Selected Barangays within the Five Drainage Areas in Metro Manila, Philippines

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Abstract

Among the significant problems confronting community-based solid waste management in the Philippines is improving community participation and implementing proper solid waste management (SWM). To address this challenge, rewarding barangays for adopting best practices in SWM is one solution. Such compensation for improved performance or behavior change is known as an incentive. Results-Based Incentive (RBI) Scheme is a mechanism that rewards barangays based on their performance in waste management, encouraging them to achieve specific targets and improve their overall efficiency in handling solid waste. Its main objective is to incentivize barangays to adopt sustainable SWM practices, reduce waste generation, practice segregation at source, increase diversion rate, and ensure proper waste disposal. The RBI scheme was launched in the 85 selected barangays within the drainage areas of Balut, Vitas, Paco, Tripa de Gallina, and Labasan Pumping Stations in the Philippine metropolitan area. The barangays were ranked from highest to lowest from April to June 2023, aiming to achieve a passing grade of 60 points, indicating an improvement in their SWM systems. Specific targets and performance indicators are set, such as waste reduction rates, recycling rates, compliance with waste segregation ordinances, and proper disposal of solid waste. The result of the June 2023 assessment surpassed expectations, showcasing an improvement compared to the initial evaluation in April, with 85% of the barangays meeting the evaluation criteria. The Philippine Government will provide non-monetary incentives through community-based projects such as street lighting, construction of Materials Recovery Facilities (MRFs), and beautification of existing parks and playgrounds.

Keywords: Solid waste management; results-based incentives; community-based; Philippines; community participation

Stratified Sampling Enhanced by Remote Sensing Product Data: An Approach for Solid Waste Project and Research Surveys

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Abstract

Surveys are commonly conducted for projects or research related to solid waste management. Stratified sampling allows researchers to obtain a more representative sample from a diverse population, thereby enhancing accuracy and precision, increasing efficiency, and facilitating comparisons between groups. Remote sensing product data refers to information acquired through remote sensing technologies, depicting physical environmental conditions such as vegetation, topography, land use changes, and other physical features. In this study, remote sensing product data was utilized to develop an index or classification of areas potentially generating waste and plastic waste. A sample of 400 households was collected, divided into two sampling approaches: 200 households were selected through stratified sampling based on the remote sensing data indexing, while 200 households were chosen randomly. Data distribution analysis was conducted using descriptive statistics, box-plot analysis, and histograms. Additionally, hypothesis testing was performed using t-tests to explore significant differences between the two sampling methods. The performance of machine learning models was assessed through linear regression, with the target variables being waste generation and plastic waste generation. Hypothesis testing indicated that there were significant differences between the results of the two sampling methods. The data distribution generated by both methods showed better outcomes for stratified sampling. The Mean Squared Error (MSE) for stratified sampling demonstrated superior performance, with values of 0.0049 for plastic waste generation and 0.23 for total waste generation. The findings of this research suggest that classifying sampling areas using remote sensing product data enhances the representativeness of results obtained through stratified sampling.

Keywords: Remote sensing product data; solid waste surveys; stratified sampling

The Current Situation of the Liquid-Bio Fertilizer Supply Chain from Feedstock to Application to Farms

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Abstract

Liquid-bio fertilizer (LBF) is anaerobic digestate from anaerobic digestion to treat waste including organic matter at a biogas plant (BGP). Effective utilization of organic wastes, such as livestock manure, food waste and sewage sludge, is required to solve environmental problems. LBF has a wide range effects as fertilizer and environmental impacts. Accordingly, it is necessary to design a method of LBF application for considering environmental impact and fertilizer effect. Therefore, the objectives of this study were to investigate the current situation of the LBF supply chain from feedstocks and application to clarify factors affecting the LBF characteristics and its effects as fertilizer. Oral Interviews were conducted with employees of eleven BGPs with different supply chains in Japan and farmers who use LBF derived from each BGP. As a result, monthly variations in feedstock input, solid-liquid separation after fermentation, stirring during storage, and BGP conditions were found to have the potential to cause variations in the concentrations of fertilizer components and soil amendments in the LBF. The effects of these factors are also expected to be greater when the remaining amount of LBF in the storage tank is low in the latter half of the application period. The variability caused by these factors could destabilize the fertilizer effectiveness and environmental impact of LBF application and could cause serious BGP operational problems. It is necessary to quantify the influence of the factors and find the most significant factors in the supply chain.

Keywords: Anaerobic digestion; liquid bio-fertilizer; ammonia volatilization; regenerative agriculture

**Parallel Session 2 :
Circular Economy in
Waste Management**

Current State of Solid Waste Management Access for Circular Economy Readiness

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Abstract

Access to waste management services in cities/regencies Indonesia is still limited on average to only 39.1%. Increasing access to waste management is still needed in line with new challenges in waste management which expect more waste to enter the production and consumption system. Increasing access to waste management does look like a linear economic concept. However, it is in line with the principles of a circular economy which prioritizes materials as long as possible in the production and consumption system. How can we improve access to waste management services in Indonesia? In the perspective from waste leakage into the environment, the source of waste leakage tends to be near the waste generator rather than waste leakage from the solid waste management services. This shows that waste management intervention should start from the source of waste generation, where waste leakage into the environment is the greatest. Apart from that, efforts to reduce waste into the environment can be made if collection services are improved.

Keywords: Access; circular economy; source generation; waste management; waste leakage

The Development of a Sustainable End-of-Life Vehicle Processing Operation in Kiribati

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Abstract

Kiribati is a Small Island Developing State situated around where the Equator and the 180° Latitude line cross. The population is around 125,000 people, spread over 33 islands which are all atolls spread over 3.5 million km² of ocean, but the total land area is very small at 811km²; the road system on the capital is about 50km long. Vehicle imports are currently c.1,200/yr, and almost all are second hand small Japanese models; life expectancy of an imported car is around 4-6 years. Shipping costs for export of scrap are very high. The challenge is to build an ELV processing system that is financially sustainable, and this paper looks at how to incorporate cars into the existing Kiribati Container Deposit Legislation (CDL) for drink cans and bottles and lead-acid batteries, and so place a deposit on cars at import and pay out a refund on ELVs as part of that CDL system. The primary revenue streams will come from the sale of spare parts from ELVs, along with Handling Fees (being the difference between the Deposit and the Refund) tow truck and ELV collection charges, plus sales for recycling of polypropylene scrap, and both ferrous and non-ferrous scrap metals. This paper analyses the existing legal framework, the legislative changes required, the equipment and labour operation costs, capital costs, and projected revenue streams of the proposed ELV processing system.

Keywords: ELV recycling; container deposit legislation; Kiribati; atoll; handling fees

Study on Recycling of By-product Salt by Bipolar Membrane Electrodialysis Device

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Abstract

In Japan, where land for landfill is difficult to secure due to the small size of the country, incineration, which is the most effective way to reduce the volume of waste, has been the basic method of waste disposal. A large amount of chlorine remains in the incineration residue generated by incineration. Although chlorine is not included in the water quality regulation items, if it is discharged into the aquatic environment at high concentrations, it can cause damage to agriculture and the ecosystem. Furthermore, when desalination is performed to address this issue, concentrated solution and dried salt produced by evaporation and solidification of the concentrated solution (byproduct salt) are generated along with the demineralized water. As one of the options for recycling methods, we conducted a development study on the use of a bipolar membrane electrodialysis (BPED) to generate acid and alkali for use as a neutralizing agent and other purposes.

Keywords: Byproduct salt; electrodialysis; recycle; eco acid; eco alkali

Circular Economy of PET Bottles in Malaysia through Life Cycle Assessment

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Abstract

In the closed-loop recycling system of PET bottles, post-consumer PET beverage bottles are collected and recycled to produce new PET beverage bottles, in which the cycle is repeated. By definition and concept, bottle-to-bottle recycling offers a pathway for Malaysia to achieve its national targets for plastics, which includes increasing collection for recycling rates and incorporating the usage of recycled plastics into new products. However, bottle-to-bottle recycling requires a clean collection system for post-consumer PET bottles, such as reverse vending machines and processors capable of processing food-grade recycled PET pellets. The present study adopted the life cycle assessment (LCA) methodology following ISO14040 to access and compare the environmental impact of the life cycle of PET bottles under bottle-to-bottle recycling with other end-of-life scenarios in Malaysia including alternative recycling pathways, including the open loop, bottle-to-fibre recycling, where PET bottles are recycled into recycled polyester fibre. Through LCA, the environmental hotspots and potential environmental benefits present in the potential bottle-to-bottle recycling can be accessed. It is expected that the PET bottle collection and recycling process under bottle-to-bottle recycling results in higher environmental impacts; however, a significant portion of its environmental impact may be offset by the reduction in virgin PET resins required for PET bottle production.

Keywords: Life cycle assessment; upcycling; PET bottle; circular economy; environmental impact

Solid Wastes Management of Monastery by Circular Economy

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Abstract

Along with the natural uses for production and consumption; various waste types, particularly solid wastes have been massively increased. Municipal solid waste is one of the critical generating solid wastes. Monastery, as one type of municipal solid wastes generating sources, has been rarely justified for solid waste management. This paper is to present solid wastes management of the Monastery using circular economy (CE) concept. The study monasteries included Chakdang and Suankeaw Temples in Thailand. Both temples have carried out solid wastes management on CE approach, 5 Rs (Reduction, Repair, Recycle, Reuse, Refurbish), but different in some Rs implementation. Chakdang Temple has emphasized recycle processing particularly plastic bottles recycled to fibres to proceed for yellow robe for monk, blanket, T-shirt, etc; biodegradation of food wastes to fertilizer by digestion tank, composting of plant residue to fertilizer, conversion of plastic bags, plastic straws to gasoline by pyrolysis. The CE approaches were mainly reduction through separation together with recycle, and some repair and refurbish. While Suankeaw Temple has used the donated items (mostly electric items and furniture including televisions, refrigerators, fans, computers, beds, wardrobes, chairs, tables, etc) for solid wastes processing through separation and selling to the old goods retailing shops by auction; bio-degradation of animal excreta wastes to earthworm-fertilizer as well as bio-degradation of food wastes, agricultural residue mixed with human excreta and animal manure to fertilizer. The approach was mainly reduction together with repair, and some refurbish. The outcome of the Circular Economy approach for both monasteries has been attained Sustainable Development Goal. The research also studied for the factors influencing towards Resulted Base Management.

Keywords: Monastery; solid wastes management; circular economy; value addition

Benefit-Cost Analysis for Plastic Waste Treatment Using Modular Pyrolysis Technology in Rural Areas of Bali Province

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Abstract

Decentralized waste processing offers a viable solution to reduce environmental pollution from waste. This study examines the impact of using modular pyrolysis machines for plastic waste management and economic outcomes in rural areas, focusing on the villages of Pacung, Wanagiri, and Punggul in Bali Province. The cost-benefit analysis method was employed, considering economic costs, emission risks, and social costs, while the benefits assessed include reduced emissions, decreased waste transport to landfills, product utilization, waste management levies, and heightened social awareness. The analysis, using Net Present Value (NPV) and Benefit-Cost Ratio (BCR) methods, revealed that modular pyrolysis machines have the potential to reduce plastic waste leakage and decrease landfill burden, particularly for low-value plastic waste. However, operational costs exceed the economic benefits, with the cost of processing 5 kg of plastic waste at Rp. 20,000 (excluding wages) and the benefit value at Rp. 18,000. The annual operational cost of the pyrolysis machine accounts for 4–12% of the total operational cost of the waste processing facility, depending on the amount of plastic processed. While modular pyrolysis technology presents environmental benefits, economic challenges remain for its broader implementation.

Keywords: Waste management; benefit; cost; pyrolysis machine; plastic waste

**Parallel Session 3 :
Innovative Approaches to
Sustainable Landfilling**

Neutralization of Landfilled Incinerator Ash Layer Using High Carbon Dioxide Dissolved Solution and Crystal Growth on the Surface of Incinerator Ash Particles

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Abstract

In Japanese landfills for municipal solid waste, the main landfill material is incinerator residue, and incinerator residue contains a large amount of alkaline substances. As a result, some landfills have high pH values of leachate and have failed to meet effluent standards (less than 8.6 for terrestrial areas) for a long period of time. Many past studies on neutralization of incineration residue have examined the use of carbon dioxide (CO₂) gas to neutralize incinerator ash and insolubilize heavy metals. Ultrafine bubble (UFB) has been used in various fields as a technology to increase the presence of bubbles in water. However, there are few examples of CO₂ gas use, and the authors have continued to study CO₂-UFB solution. We have created a solution in which CO₂ is dissolved to saturation using a UFB generator nozzle (high CO₂ dissolved solution), and confirmed that the pH of the leachate decreases when this solution is passed through the incinerator ash layer. In this report, the quality of the leachate from the incinerator ash layer after passing through a high CO₂ dissolved solution were shown. Effluent pH was decreased to 8 or less. SEM observation and elemental composition by SEM-EDX of incinerator ash particles in the incinerator ash layer after passing through a high CO₂ dissolved solution was shown. Reaction products were generated on the surface, and it was confirmed that some of these products were CaCO₃.

Keywords: Incinerator residue; carbonic acid neutralization; ultra fine bubbles; particle surface observation

Study on Early Stabilization of Sea Surface Landfill by Airlift Pump Method

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Abstract

In Japan, 78% of the waste in municipal solid waste landfill sites consists of incineration residues (excluding cover soil). When incineration residues are disposed of in landfill site, it is necessary to continue leachate treatment for an extended period due to the effects of desulfurization agents and chelating agents. Particularly in the case of the sea surface landfill, the surplus water comes into contact with air, resulting in neutralization and oxidation. However, the waste submerged underwater remains constantly immersed, preventing contact with air, which hinders the neutralization and oxidation of the percolating water. As a result, pH, COD_{Mn}, and T-N concentration do not decrease over a prolonged period. It has been confirmed that especially the reduction of pH requires a long period of time. In this study, to promote the early stabilization of the sea surface landfill, a simulated landfill experiment was conducted using an airlift pump to forcibly aerate and circulate the infiltration water. By mixing and circulating the surplus water and percolating water, the aim was to achieve uniformity and reduction in water quality parameters. As a result, it was found that the airlift pump method not only stabilized the percolating water but also had a positive effect on stabilizing the surplus water.

Keywords: Sea surface landfill; early stabilization; airlift pump method; percolating water circulation; reduction of surplus water quality

Instructions Manual for Final Disposal Site Maintenance

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Abstract

In order to properly operate and safely use a final disposal site, it is necessary to manage waste transport, landfill operations, facility maintenance, environmental management, and landfill condition management at the end of the landfill or when the site is used. Various facilities are designed and constructed on the premise that sufficient maintenance and management will be carried out to maintain the prescribed functions, and if maintenance and management are not appropriate, the functionality of the facility may deteriorate. In other words, in order for a final disposal site to perform its functions, it needs to be appropriately planned, designed, constructed, and managed and operated appropriately. This management should be carried out until the final disposal site is abolished, and it is necessary to use the site in accordance with the stability of the landfilled waste and the management status. However, it cannot be said that the current final disposal sites are not necessarily maintained satisfactorily. This paper will report a maintenance and management manual for final disposal sites to reduce long-term environmental impacts. It was developed by cooperation of Sustainable Society Promotion Consultant Association and The Landfill System & Technologies Research Association of Japan.

Keywords: Landfill site; operation; maintenance; manual

Maintaining Stability of Landfill using Geosynthetics to Reduce Geo-risk Towards Community

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Abstract

By 2050, urban populations in Asia are expected to reach 70%, generating up to 3.8 billion tonnes of waste annually. This surge poses significant geotechnical challenges, particularly in landfill safety. Slope failures, driven by steep gradients, waste materials, and excess water, present serious hazards. Historical incidents, such as Shenzhen landfill collapse in China and Bandung landfill collapse in Indonesia, underscore the need for effective risk management, especially during intense rainfall. Risk treatment is an important step in risk management, whereby by implementing the right risk treatment alternatives, the life of an asset or safety of public can be extended. One of risk treatment alternatives is risk mitigation by providing adequate buffer zones which involves analysing landslide parameters like flow velocity and horizontal run-out distance. Other structural measures to mitigate risks include reinforcing slope embankments, installing sealing caps, by using geosynthetic products such as geogrids and geomats. These products help control erosion, minimizing rainfall infiltration and enhance the stability of landfill slopes. In Germany, the design of geosynthetic products with a lifespan of 100 years is a standard practice, ensuring long-term stability and recognizing them as permanent mitigation measures which has proven effective in maintaining landfill safety and preventing slope failures. This paper examines several case studies, demonstrating the successful application of geogrids and geomats in enhancing landfill stability and safety. These examples highlight the importance of adopting advanced geotechnical solutions to address the growing challenges posed by increasing waste generation in urban areas towards communities.

Keywords: Geosynthetic; risk mitigation; landfill; slope failure; sustainability

Surface Temperature of Different Geomembranes Under Hot Climate in Malaysia and Their Significance in Landfill Liner Design & Installation

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Abstract

The increasing adoption of coloured polyethylene (HDPE and LLDPE) geomembranes in environmental containments inclusive of waste landfill has been driven mainly by their superior performance against thermal and UV degradation which directly impact the liner's performance, durability, and overall effectiveness. In this study, four (4) different coloured (black, white, tan, and green) HDPE geomembranes were exposed to the Malaysian weather and subjected periodical monitoring. This paper presents the results of the study aimed at quantifying the difference in heat generation on the geomembrane under solar irradiation and its effect on the geomembrane performance. The study also examines the relationship of geomembrane temperature with regards to wrinkles formation and its impact to the quality of installed geomembrane. The paper is aimed to provide valuable data on the suitability and outstanding performance of coloured geomembranes under exposed conditions particularly for waste landfill applications in hot climate countries like Malaysia.

Keywords: Waste landfill; HDPE; coloured geomembrane; degradation; wrinkles; solar irradiation

**Parallel Session 4 :
Waste Transformation and
Valorization Technologies**

Influence of Temperature Evolution on Moisture Removal Efficiency During Wet-Refuse-Derived Fuel Production: Experimental Insights for Process Optimization and Scaling

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Abstract

The production of refuse-derived fuel (RDF) from municipal solid waste through biodrying technology offers a substitute for traditional fuel in cement plants. However, in developing countries, mechanical biological treatment often results in substandard RDF quality due to high organic and moisture content. Notably, the influence of organic content on moisture removal efficiency and temperature patterns during biodrying remains poorly understood, posing challenges for experimental design and process scaling. This study investigates temperature patterns during the biodrying of three wet-RDF types with varying organic content: wet-RDF1 (50-60%), wet-RDF2 (10-30%), and wet-RDF3 (4-10%). Experiments were conducted in a 0.3 m³ square lysimeter with 1.2 m high wet-RDF layers, under a continuous airflow of 0.4 m³/kg wet-RDF/day. Results revealed distinct temperature evolution phases for each wet-RDF type. Wet-RDF1 exhibited a rising phase (days 0-3), stable phase (days 3-4), and declining phase (days 4-7). Wet-RDF2 had similar phases on days 0-5, 5-7, and 7-15, respectively, while wet-RDF3 showed these phases on days 0-9, 9-11, and 11-14. The rising phase duration correlated with organic content, while the stable phase lasted only 2-3 days. To optimize moisture removal, the biodrying process should be terminated at day 4 for wetRDF1, day 6 for wet-RDF2, and day 10 for wet-RDF3. This study provides crucial insights for scaling up pilot operations with greater capacity for temperature maintenance and moisture removal to produce higher-quality RDF.

Keywords: Biodrying; refuse-derived fuel; organic content; temperature pattern

Characterization of Sustainable Graphitic Biochar from Food Waste via Microwave Irradiation Technique

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Abstract

The rising global demand for energy and the necessity for sustainable waste management have prompted researchers to investigate innovative approaches to converting waste materials into valuable products. In this research, we introduce a new method for producing sustainable graphitic carbon from food waste using microwave irradiation. Food waste, a readily available and abundant resource, was chosen as the starting material owing to its high carbon concentration and potential for transforming into graphene-based materials. By utilizing microwave irradiation, rapid heating and controlled oxidation were induced to facilitate the effective conversion of food waste into graphitic carbon. The produced substance underwent analysis such as X-ray diffraction (XRD), Thermogravimetric Analysis (TGA) and scanning electron microscopy (SEM) to verify its structural characteristics and graphitic properties. The findings indicated that the microwave irradiation process successfully converted food waste into graphitic carbon with minimal imperfections. The new material has excellent electrical conductivity and mechanical endurance, making it appropriate for a variety of applications such as energy storage devices, catalysts, and composite materials. This investigation underscores the potential of utilizing microwave irradiation as an eco-friendly and effective method for converting food waste into valuable graphitic carbon, contributing to the advancement of a circular economy and diminishing the environmental consequences of waste disposal.

Keywords: Food waste; biochar; microwave-assisted pyrolysis; graphitic carbon; sustainable materials

Sustainable Biodiesel Production from Waste Cooking Oil Using Diatomite as a Catalyst

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Abstract

Biodiesel production from waste cooking oil via the transesterification process is one of the sustainable alternatives to fossil fuels. This study explores an alternative catalyst for biodiesel production that can significantly benefit the green energy industry. Waste cooking oil and fresh cooking oil were used as feedstocks for the transesterification process. The experiment manipulated the methanol-to-oil ratio and catalyst dosage. The reusability of diatomite was assessed based on conversion efficiency. The use of diatomite in the transesterification of waste cooking oil produced a biodiesel yield of 90.49%, which was closely comparable to the 93.28% yield obtained from fresh cooking oil. The optimal condition was achieved with a 6:1 molar ratio of methanol to oil and 1.0 wt% diatomite. FTIR analysis confirmed biodiesel production with appearance of new peaks at 1435 cm^{-1} and 1196 cm^{-1} . Diatomite's reusability was efficient, achieving up to 70% conversion after three cycles, showing its potential to reduce biodiesel production costs. This study demonstrated that diatomite was an effective catalyst for the transesterification process, contributing to the advancement of sustainable biodiesel energy.

Keywords: Biodiesel; waste cooking oil; diatomite; transesterification; catalyst

Effect of Aluminosilicate-Based Additives on the Physicochemical Properties of Palm Fiber and Shell Ash

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Abstract

In Malaysia, palm oil extraction generates palm fiber and shell (F&S) waste, which can be converted into energy through combustion. However, the high potassium content in F&S can cause issues like slagging, fouling, and corrosion during combustion. This study investigates the use of aluminosilicate-based additives, specifically kaolin and PreKot™, to mitigate these challenges by improving potassium retention and ash properties. Three key objectives are explored: characterizing palm F&S and additives, analyzing the additives' impact on potassium retention during combustion, and evaluating the physical properties of the ashes. Proximate and ultimate analyses were conducted on palm F&S, revealing a volatile matter content of 49.42% for palm fiber and 46.89% for palm shell, with higher fixed carbon content compared to other research. Chemical analysis via X-ray fluorescence (XRF) indicated that potassium retention in ash increased proportionally with additive amounts, while additive type had no significant effect on particle size. Particle Size Distribution (PSD) and Scanning Electron Microscopy (SEM) revealed that additives did not influence ash particle size, but ashes with PreKot™ had the largest particles and irregular shapes.

Keywords: Combustion; palm fibre and shell; aluminosilicate-based additives; particle size distribution; potassium retention

Green Waste-Synthesized Gold Nanoparticles/ Nanofluid for Solar Harvesting Technology

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Abstract

This study focuses on exploring the capability of the green waste-synthesized gold (Au) nanoparticles/nanofluid for the application in the solar harvesting technology. Previous work has succeeded in synthesizing the gold nanoparticles (AuNPs) via green synthesis method using the peel of *Artocarpus odoratissimus* (tarap fruit). While the peel of the fruit is typically discarded as waste, it was utilized in the green synthesis process where the fruit peel extract served as both reducing and capping agent to effectively assist in nanoparticles formation. From the characterization of the synthesized nanoparticles, the absorption peaks of the AuNPs from UV-visible spectroscopy is around 533–537 nm, varying with synthesis parameters. TEM analysis indicated particle sizes ranging from 12 to 25 nm. Meanwhile, XRD analysis confirmed the formation of AuNPs, and FTIR analysis suggested interactions between phytochemicals and AuNPs, contributing to their reduction and size control. Preliminary study has shown the potential of the synthesized Au nanofluid to be adopted in the direct absorption solar collector system (DASC). This is due to its higher capability to absorb sunlight and convert it into heat. The nanofluid demonstrated a remarkable temperature difference, with a maximum temperature difference of approximately 10°C when compared with water. This system offers the advantages of being time-efficient and easily adaptable for small-scale solar collectors. Future works on the heat loss are anticipated to further optimize the thermal efficiency of the solar collector system.

Keywords: Gold; nanoparticles; nanofluid; green synthesis; *Artocarpus odoratissimus*; DASC

Development of Durable Superhydrophobic Coatings with Enhanced Surface Roughness for Carbon Steel Substrates

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Abstract

This research addresses the critical problem of achieving a balance between high durability and extreme water repellency in superhydrophobic materials, as current approaches often compromise surface endurance due to increased roughness and wettability. The primary objective was to develop a robust and cost-effective superhydrophobic coating using a simple brush-coating technique with polydimethylsiloxane (PDMS)-modified epoxy and stearic acid-modified zinc oxide (ZnO) combined with calcium carbonate (CaCO_3) applied to carbon steel substrates. The methodology involved evaluating the coating's performance through water contact angle (WCA) and sliding angle (SA) measurements, alongside Atomic Force Microscopy (AFM) characterization to assess surface structure. The results revealed outstanding superhydrophobicity, with a WCA of $172.54 \pm 1.5^\circ$ and an SA of 1.5° , alongside a nanoscale porous network structure contributing to the low surface energy. This durable EP/PDMS/SA/ CaCO_3 /ZnO coating not only provides effective corrosion protection but also supports sustainable waste management practices by prolonging the lifespan of materials in various industrial applications, particularly in maritime and construction sectors, where it mitigates environmental impacts associated with corrosion-related waste. Ultimately, this study highlights the potential of advanced superhydrophobic coatings in enhancing material resilience and contributing to environmental sustainability efforts.

Keywords: Superhydrophobic; epoxy; WCA; durability; ZnO; CaCO_3

**Parallel Session 5 :
Innovative Waste Treatment
and Disposal**

Estimating the Allowable High Loading of Waste Products to Anaerobic Digestion for Food Waste

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Abstract

Despite decreasing food waste due to population decline and food loss reduction efforts, enhancing biogas production remains important. This study investigated the allowable high loading of waste products to AD for food waste. Nine waste products—nutritional supplements, furikake, cookies, soft candy, BBQ sauce, cream cheese (cheese A), processed cheese (cheese B), margarine, and palm oil—were evaluated using biochemical methane potential assays. Pretreated samples (0.5, 1.5, 5, 15 g-wet) were added to vials with inoculum collected from a 100t/d AD facility and incubated at 37°C for 30 days. Daily biogas and methane generation were measured, and pH, TS, VS, NH_4^+ , TOC, and VFA analyses were carried out after the incubation. Results indicated the highest cumulative methane production per g-VS at the lowest input amount, decreasing with higher inputs. Carbohydrate-based samples showed significant acidification with pH dropping to 3.34–5.08, while lipid-rich samples experienced pH reductions to 5.98–6.67 and high VFAs, leading to methane production inhibition. Supplements caused ammonia inhibition due to elevated NH_4^+ . The occurrence of inhibition, defined by the slope of cumulative methane production against the sample input amount, was plotted against methane production potential. High lipid content was correlated with high methane potential and susceptibility to inhibition, particularly due to the properties of fatty acids. Margarine exhibited relatively low fermentation inhibition occurrence and high methane production potential, highlighting its suitability for enhancing the economic sustainability of AD facilities. The index suggested in this study can be an indicator to estimate the degree of inhibition by the organic composition of different food waste products.

Keywords: Anaerobic digestion; food waste product; high organic loading rate; inhibition; index

Comparative Analysis of Heat Balance Models in the Solar Greenhouse Biodrying System

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Abstract

High moisture content (MC) in municipal solid waste (MSW) complicates incineration operation, waste transportation, and recycling. Biodrying is an aerobic process utilizing metabolic heat to evaporate water for moisture reduction. Applying a greenhouse in the biodrying process is beneficial as it captures solar radiation to warm the system and increase water-holding capacity of the air. Additionally, the greenhouse cover prevents rainwater from remoisturizing the waste pile. This study compared two heat balance models of the biodrying under greenhouse condition to propose a simplified method for analyzing heat utilization within the system. The first model (Model A) included equations for the temperatures of the waste pile, greenhouse headspace, ambient, and structural materials in the system. The latter model (Model B) was simplified to only consider the temperatures of the waste pile, ambient, and greenhouse headspace. The predicted values were compared with experimental data from the pilot-scale solar greenhouse biodrying system at the aeration rate of $0.78 \text{ m}^3/\text{kg}_{\text{waste}}/\text{day}$. Model A provided higher accuracy for waste temperature prediction with lower mean bias error (MBE) of 2.66 and 63% of predicted values within the actual range. It was able to estimate surface material temperatures but required complex calculations. Model B, with simplified calculations, accurately estimated greenhouse headspace temperature (MBE -1.22) as similar as Model A (MBE -2.37). Although Model A achieved greater predictive accuracy, it involved a more complex calculation process than Model B. To improve the heat balance model for biodrying under greenhouse condition, several key challenges need to be addressed. These include accounting for time-delay effects in predicting greenhouse headspace temperatures, as well as accurately estimating microbial activity and the rate of organic matter degradation. Additionally, including heat elements (the enthalpy of inlet and exhausted air) would enhance the realism of the heat balance model, providing a more accurate representation of the biodrying process under greenhouse condition.

Keywords: Biodrying; heat balance model; municipal solid waste; solar greenhouse

Rubber Seed Shell Based Activated Carbon as Potential Biosorbent for the Removal of Heavy Metals from Aqueous Solution

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Abstract

This research investigated the utilization of rubber seed shell from agricultural waste which abundant in Malaysia as raw material for the production of low-cost activated carbon as potential biosorbent for heavy metal removal application. In this study, the RSS raw material was impregnated using NaOH by chemical activation method to improve the surface porosity of the activated carbon prepared for the removal of lead and copper the characterization of the RSS based activated carbon produced were examined through Scanning Electron Microscopy, Fourier Transform Infra-Red and X-ray Diffraction analysis. The biosorption capacity of rubber seed shell activated carbon for the removal of lead and copper was evaluated via batch biosorption test. The effect of initial concentration of the heavy metal (200 ppm, 400 ppm, 600 ppm and 800 ppm), contact time (15 min, 30 min, 45 min and 60 min) and biosorbent dosage (0.05 g, 0.10 g, 0.15 g and 0.20 g) were studied to determine the best condition in order to achieve maximum biosorption removal of selected heavy metal. Results showed that under best condition of 200 ppm initial concentration and 60 min contact time, highest removal at 77.45% of copper and 99.20% of lead are successfully achieved with 0.20 g as the dosage amount. The obtained experimental results shows that agricultural waste by-products from rubber seed shell is a promising low-cost precursor for the production of activated carbon and it can be potentially used as biosorbent for the removal of heavy metals especially lead.

Keywords: Rubber seed shell; activated carbon; heavy metal removal; chemical activation

Conversion of Oil Palm By-Products as Carrier Materials in Expanded Bed Process

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Abstract

Oil palm wastes are widely available as agricultural by-products throughout Southeast Asia, particularly in Malaysia. This abundant supply has prompted the need for innovative approaches to minimize these wastes and develop reuse technologies. Meanwhile, the application of aerobic or anaerobic microorganisms in wastewater treatment offers a highly effective and environmentally friendly solution. These microorganisms degrade or absorb dissolved, colloidal, particulate, and settleable organic matter, transforming it into biological flocs or biofilms. Unlike physical treatment methods that rely on physical separation, this microbial process leads to genuine organic matter destruction. Although various materials have been employed as carrier materials in bioreactors using expanded bed processes, the use of co-products from industrial processes has not been extensively explored. In response to this gap, the current study developed three (3) promising carrier materials from oil palm by-products: activated carbon from palm kernel shell (AC-PKS), chemically treated palm oil fuel ash (CT-POFA), and activated carbon from empty fruit bunch (AC-EFBF). Additionally, palm oil clinkers (POC) were washed, crushed, and tested. All four (4) materials were evaluated as carriers in expanded bed bioreactors for treating palm oil mill effluent (POME). Among them, AC-PKS showed the highest potential, meeting key selection criteria with rapid start-up and good removal efficiency of organic pollutants. The AC-PKS-filled reactor exhibited the best performance, achieving over 70 % COD removal at a loading rate of 4.71 to 5.71 kg m³ per day, closely followed by the POC-filled reactor. Both operated efficiently with a 24-hour hydraulic retention time (HRT).

Keywords: Agriculture; biofilm; carrier material; pollution; waste

Co-Pyrolysis of EFB and UPCO over Nickel Oxide Loaded HZSM-5: A Comparative Co-Pyrolysis Study via Thermogravimetric Analyser and Fixed-Bed Reactor

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Abstract

The abundance of empty fruit bunches (EFB) in Malaysia, which were once discarded as waste, has recently been recognized as a potential source for biofuel production. The main objective of the present work is to evaluate the impact of nickel oxide-loaded HZSM-5 (NiO/HZSM-5) on the co-pyrolysis of EFB and UPCO via thermogravimetric analyser (TGA) and fixed-bed reactor separately. The NiO/HZSM-5 was prepared via incipient wetness impregnation method and characterized for physicochemical properties. First, for co-pyrolysis via TGA, the pyrolysis temperature for all samples was fixed from 30 to 700°C. The mass loading was fixed for EFB, EFB-UPCO, EFB-HZSM-5, EFB-UPCO-HZSM-5, EFB-UPCO-(1%)NiO/HZSM-5. Second, for co-pyrolysis via fixed-bed reactor, the temperature was fixed at 600°C. From TGA results, the usage of UPCO for pyrolysis with EFB has generated higher mass loss (99.73%) compared to pyrolysis of EFB and EFB over HZSM-5 at 90.54% and 73.33% respectively. From the fixed-bed reactor, pyrolysis of EFB has generated no hydrocarbons in biofuel. The loading of UPCO has increased the hydrocarbon yield by 64.90%. Catalytic co-pyrolysis over Ni/HZSM-5 had proved to increase oil yield and enhance hydrocarbons. The pyrolysis of EFB with UPCO provides an approach in which UPCO can serve as a hydrogen source to enhance the biofuel quality, and NiO enhances the cracking of the oxygenated vapours into hydrocarbons.

Keywords: Biomass; cooking oil; co-pyrolysis; nickel; HZSM-5

UAV Photogrammetry in Waste Disposal: Evaluating Density and Capacity Expansion

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Abstract

The increasing generation of waste is one of the major problems in developing countries. However, the waste disposal sites may be unable to manage the generated waste effectively in the future. Therefore, evaluating the waste dump density is crucial for estimating the capability of the disposal sites. Additionally, waste compaction is an important operational practice because it helps increase waste capacity and improve waste dump stability. However, evaluating waste compaction or density could be challenging. This study aims to evaluate the effectiveness of UAV photogrammetry in determining waste density in a controlled open dump. DJI Phantom 4 Professional UAV was used to capture aerial images at the Praeksa disposal site to generate a DEM. The flight configuration was determined with 80% and 75% frontal and side overlapping, respectively. The camera angle was adjusted to capture aerial images at 45 and 90 degrees. A total of 12 waste samples were mined to categorize waste composition and moisture content, and the total weight of the mined waste from each sample point was measured to calculate density. The results indicate that the average waste density is approximately 664.69 kg/m³, ranging between 240.34 to 1,428.85 kg/m³. The results from photogrammetry technology are consistent with those of other research studies. This suggests that the flight configuration adjustments made in this study could be used to investigate waste density in a time-efficient. These findings demonstrate the potential of UAV photogrammetry for enhancing waste management practices through accurate, less destructive, and efficient waste density assessments.

Keywords: Flight configuration; waste dump density; unmanned aerial vehicle

**Parallel Session 6 :
Island Waste Management**

Development of a Waste Management Authority for Kiribati

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Abstract

Kiribati is a Small Island Developing State situated on the Equator in the central Pacific Ocean; the population is around 125,000 people, spread over 33 atolls which are spread over 3.5 million km² of ocean and in three island groups. Most of the population lives in the Gilbert Islands, with 60% of the country's total living in the capital, which is divided into two urban Councils areas, each with its own waste collection. Economic growth over the last decade means that there is far more waste generated today. The Ministry of Culture and Internal Affairs oversees Councils, which are also on each atoll, whilst the Ministry of Environment, Lands and Agricultural Development is responsible for overall waste management. Landfills are built by the government but operated by Councils. The result is a fractured, highly inefficient waste management system without clear responsibilities for operations or planning for the future. This paper looks at the challenges of extracting the waste management functions from the Councils, and the associated revenue streams, and creating a statutory authority, the Kiribati Waste Management Authority, which would take on responsibility for all waste collection, recycling operations, and landfill management and construction. The Authority must be sleek and efficient, not become another large bureaucracy, and work with the private sector to ensure that waste collection services are sufficient and that planning for future capacity requirements is in place. The existing Public Private Partnership in the Container Deposit Legislation recycling system in Kiribati provide an excellent model.

Keywords: Kiribati; waste management authority; waste management; atoll; container deposit

Technical Cooperation on Waste Management in the Pacific Region

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Abstract

Pacific Island Countries has been facing difficulties in their waste management in their small land areas, due to their economy and society that is highly dependent on imports, while their domestic recycling market is also quite limited. In addition, they are exposed to many natural disasters such as cyclone, earthquake, eruption and tsunami, which resulting the generation of huge disaster waste. Since 2000, the Japan International Cooperation Agency (JICA) has been providing technical and financial assistances to Pacific Island Countries in the field of waste management. In particular, JICA has been implementing a regional technical cooperation project called J-PRISM since 2011 in cooperation with the Secretariat of the Pacific Regional Environment Programme (SPREP). Through this project, JICA has supported Pacific Island Countries to improve their waste collection, transportation and final disposal sites, as well as the capacity development of counterpart personals of the countries. As its unique initiative, JICA has been also working on the waste reduction under the concept of “3R+Return”, by seeking the ways on transporting recovered resources off the islands. These pioneering efforts have now led to the expansion of cooperation from other developed countries such as Europe, the United States, Australia and New Zealand. This paper provides an overview of JICA's cooperation in waste management in Pacific region and discusses the further challenges the Pacific Island Countries are tackling for the future.

Keywords: Pacific island countries; technical cooperation; J-PRISM; SPREP; 3R+Return

Rehabilitation, Monitoring and Extension of Landfills in an Atoll Environment.

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Abstract

Kiribati is an atoll nation; there are three controlled landfills only, present in the capital Tarawa, where they are built into the tidal lagoon sand flats. The construction of the landfills is simple, and no liners are used, being a sand berm covered with a concrete skin. Water testing at a various interval over the last decade indicates that pollution from landfills is better than might be expected, and studies of the water movement indicate that the coral sand - calcium carbonate - is treating the leachate to provide an interesting Nature-Based Solution to the problem of leachate management, a point learned at APLAS 2012. However, when the landfills were built in the early 2000's this information was not available to the builders. Two of the three landfills are now full, and extensions need to be built. The information from studying the landfills can now be used to feed into a new design of landfill that will be suitable for atoll locations without costly and vulnerable leachate treatment systems. A full landfill on Tarawa has been rehabilitated to provide usable land that is some of the highest in the country. The process and cost of such rehabilitation has been monitored over the past year as 1.6 hectares of old landfill are converted into a Materials Recovery Facility for the existing container deposit recycling system. This paper brings together all of the experience and knowledge gained with working these landfills over the past 20 years.

Keywords: Atoll; landfill; leachate management; nature-based solution; landfill design

Study on the Quantitative Analysis of the Work-loads in Waste Hand-sorting

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Abstract

The Hand-sorting is the most basic and primitive technique of waste treatment. Although waste hand-sorting has been partially replaced by the combination of AI recognition and robot pick-up, the necessity of hand-sorting remains in various waste treatment process. Hand-sorting, which is considered to be a high workload, is required to be performed with a lower load. However, knowledge is needed regarding the relationship between the hand-sorting work environment and the burden on workers, but there is little related research. The purpose of this study is to clarify the quantitative relationship between waste hand-sorting work and physical load in order to establish a low fatigue work environment. An experiment was conducted to monitor actual work using a manual sorting line that sorts PET bottles from source separated municipal solid waste. Workers wore wearable biosensors for measure the work intensity, physical activity and muscle load. In addition, conscious and unconscious fatigue before and after the work were evaluated by questionnaire and N-back test, respectively. As a result, labor intensity, physical activity, and muscle load on the lower back tend to increase with an increase in the number of items sorted per unit time. The range of load measured this time did not cause clear fatigue to the workers in a short time (1.5 hour). As the number of items sorted per unit time increases, workers tend to pick items close to them and their physical activity increases.

Keywords: Waste hand-sorting; workload; ergonomic; fatigue; work environment

The Waste Landfill Data Collection and Management Using the Kobotoolbox Application – Pacific Islands Case Study

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Abstract

The use of the paper-based approach to record incoming waste to waste disposal sites in the Pacific Island Countries is common. While it is a low-cost method, it often leads to the loss of valuable data when the books or forms are accidentally damaged or missing before they are entered into computers. It is also common that these records are barely entered into computers and analysed for waste management and decision-making purposes. The use of electronic weighing scale system has some mixed successes and challenges. Most of the countries do not have the expertise to service and keep these facilities in good operating conditions. The locations of most disposal facilities are remote from electricity supplies.

The use of the Kobotoolbox application has been trialled in some Pacific Island Countries to improve the situation. Under the JPRISM 2 Project (2017 -2023), we introduced this system to Tonga after the Volcanic Eruption in December 2021 to gather data on the generated disaster waste. We remotely created the online system and activated for use by the Tonga Waste Management Authority in January 2022. While our regional office was based in Samoa, we were able to observe and monitor, the daily collected data in the system from four waste disposal facilities in Tonga. Tonga continues to utilize this waste recording system until to date. This same system has been introduced to Samoa, Vanuatu and Solomon Islands as part of JPRISM 2 support to Disaster Waste Management.

The lessons learnt from the Pacific Island Countries particularly Tonga are useful for other Small Island Developing States. The recording of waste is more efficient and up to date with the information readily available when needed. The recorded data can be downloaded for storage on computers or in hard drives. There is an option for keeping the data online for security with controlled access to specific officials only, in case of damaged computers or lost hard drives. Rapid reports can be automatically generated by the system for reporting and management purposes. While the accuracy of the recorded information remains an issue due to the use of volume estimation approach, having information and data is better than nothing, especially when urgently needed to guide decision making. The situation can be improved through ongoing training of field staff on volume estimation techniques using vehicles sizes. Gone are the days when data recorded in forms are re-entered in computers, or damaged and lost. Excuses by waste management officials for not having up to date waste disposal facilities data and information when needed, are no longer valid during this modern world. The Kobotoolbox application provides an option to improve waste recording and management for waste landfills and other disposal facilities.

Keywords: Kobotoolbox, pacific island countries; JPRISM 2 Project

**Parallel Session 7 :
Environmental Assessment
in Waste Management**

Study of Bandung City Food Waste Global Warming Potential

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Abstract

Food waste or food waste has become a global issue and a serious concern from various institutions ranging from food security agencies to environmental organizations. This study aims to identify the characteristics of food waste households, both in terms of generation, composition and physical and chemical characteristics through sampling or field research, carried out through 2-step composition referring to SNI 19-3964-1994 related to the method of taking and measuring samples of generation and composition of municipal solid waste, also to determine the potential impact of this type of waste in the city of Bandung, especially those that are correlated with climate change. Later, based on knowledge of the characteristics of a food waste household, this study will also provide recommendations for specific waste management based on its characteristics by considering the impact of climate change from each treatment. The result of this study has found that the most waste composition in Bandung City is from organic waste which is dominated by food waste. Most of the composition of food waste fall under fruits and vegetables waste, which have a lot of water content that correlates to volatility. Therefore, with the high volatility, the food waste releases the number of greenhouse gases which indirectly triggered the climate change.

Keywords: Food waste; economy class; waste generation, composition, characteristic; greenhouse gases emission

Integrating Environmental Risk Assessment and Integrated Risk Based Approach in Landfill Risk Evaluation

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Abstract

Landfills are a pressing environmental issue, as they can contaminate the surrounding soil, groundwater, and surface water. Domestic waste landfills, in particular, are a significant source of this contamination due to leachate seepage. Therefore, the presence of a landfill needs to be risk assessed. Landfill risk assessments in Indonesia generally do not include environmental and public health risk assessments. Environmental risk assessment has not yet been integrated with landfill feasibility evaluation using the Integrated Risk Based Approach (IRBA) method. This paper is a response to the urgent need for research on landfill environmental risk assessment and the use of IRBA in evaluating landfill risks. IRBA method is applied in deciding whether landfills should be rehabilitated and closed or upgraded. The paper aims to analyse the ecological risk assessment and the application of IRBA in Indonesia. A systematic review of research related to landfill environmental risk assessment in Indonesia and the use of IRBA was conducted from 2010 to 2023. The potential impact of this review is significant and promising, as it could lead to a more comprehensive understanding of landfill risks and better-informed decisions on their management, potentially improving Indonesia's environmental and public health conditions. It can be concluded that it is significant to integrate environmental risk assessment and IRBA in landfill risk evaluation.

Keywords: Environmental risk assessment; landfill; IRBA; waste

Environmental Risk Assessment of Sarimukti Waste Landfill Postfire in Indonesia

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Abstract

Waste management remains a significant challenge in Indonesia, one of ASEAN's largest waste producers, generating about 64 million tons annually (UNEP, 2017). Indonesia aims for 100% well-managed waste in urban areas, focusing 80% on transportation and 20% on reduction, while transitioning to processing-based waste management. Despite various solutions, significant progress is elusive. Waste pollution, including unsightly waste, foul odors, and harmful leachate, negatively impacts the environment. The Sarimukti Waste Landfill fire, caused by discarded cigarette butts during the dry season, exacerbated the situation, affecting over 15 hectares across four zones. An environmental quality evaluation using an Integrated Risk Based Approach (IRBA), as per the Regulation of the Minister of Public Works Number 03/PRT/M/2013, is essential before deciding on rehabilitating or closing the landfill. This study characterizes waste during a fire disaster, assesses leachate quality in the Sarimukti Landfill treatment plant, and conducts a rapid environmental assessment using the IRBA method to determine landfill feasibility. Burnt waste had an average water content of 10.41%, volatile content of 49.04%, ash content of 50.95%, fixed carbon of 31.05%, and a calorific value of 3391.19 cal/g. Metal content included Cu at 1.63 mg/kg, Pb at 0.37 mg/kg, and Zn at 4.85 mg/kg. Leachate quality exceeded standards for BOD, COD, and N-Total, while pH, TSS, mercury, cadmium, and MBAS were within acceptable limits. The final Environmental Risk Index assessment resulted in a very high hazard evaluation of 621.53, indicating the immediate closure of the landfill due to significant environmental and social impacts.

Keywords: Landfill waste management; landfill fire; waste characteristics; integrated risk-based approach (IRBA) method; landfill rehabilitation

Impact of Runoff, Wind, and Floods on the Macroplastic Mobilization Terrestrial Environment: Systematic Review

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Abstract

The movement of plastic pollution on land is influenced by natural phenomena such as runoff, wind, and flooding. These phenomena are critical transport parameters in models that estimate the transfer of plastic waste from land to the ocean. Historically, models have relied on expert judgment to estimate this movement, but current experiments are examining how these natural processes affect the transport of plastic. This study follows PRISMA guidelines for selecting and reviewing literature on the mobilization of plastics on land, covering aspects such as movement thresholds, mobilization probabilities, and transport velocities. The previous studies indicate that the transport of plastic waste on land is influenced by wind and runoff, with specific thresholds for each type of plastic. The movement of plastic is also affected by land type, surface roughness, and slope angles. Macroplastic transport velocities are positively correlated with wind speed but not with rain intensity. In contrast, floods have significant impacts on plastic mobilization on land, as a considerable number of plastic floats in floodwaters and is mobilized by high-velocity water. By synthesizing existing research, this study aims to provide a comprehensive understanding of current knowledge, identify gaps and areas needing further investigation into the transport behaviour of plastic pollution in terrestrial environments, and enhance the accuracy of future models predicting plastic debris movement from land to ocean.

Keywords: Plastic waste; flood; runoff; wind and model

Evaluation of Waste Management Due to The Mount Merapi Cold Lava Flash Flood Disaster in Agam Regency (Case Study in The Affected Sub- Districts)

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Abstract

Flash floods are one of the natural disasters that often occur in various parts of the world, including Indonesia. On 11 May 2024, a flash flood of cold lava from Mount Merapi hit Agam Regency. Initially, 3 sub-districts were affected by the disaster, namely Canduang Sub-district, Sungai Pua Sub-district and IV Koto Sub-district. Disasters have a negative impact on society, one of which is the increase in construction waste. Post-disaster waste management is one of the most important operational management systems ever developed to help communities rebuild after a disaster. Waste generated at the research site consists of concrete, wood, plastic, glass, metal, cardboard, rubber, paper, organics, polystyrene, and fabric. Based on the results of the evaluation of disaster waste management, disaster waste management in Agam Regency is still less than optimal both from the technical operational aspects, financial aspects and aspects of community participation. While the results of the evaluation of the suitability of disaster waste management that refers to the Minister of Environment and Forestry No. 1 of 2024 show that disaster waste management has not fulfilled the guidelines that have been set, so an SOP for disaster waste management should be prepared. The establishment of a disaster waste management system will focus on the preparation of technical guidelines and standard operating procedures (SOPs) for disaster waste management.

Keywords: Disaster; waste management, Minister of Environment and Forestry No. 1 of 2024

**Parallel Session 8 :
Community-Based Waste Management**

Women in Action: The Role of Women in Sustainable Solid Waste Management in Metro Manila, Philippines

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Abstract

The presence of solid wastes that clog waterways and accumulate at pumping stations compromises the efficiency and capacity of the flood control system in Metro Manila, Philippines. This lingering problem of solid waste accumulation in the riverways has led to the conceptualization of community-based solid waste management (CBSWM) – the prevention of solid waste dumping into the drainage systems and waterways from the source. The role of women in the initiatives of CBSWM cannot be disregarded. Women's Groups (WGs) were organized to operate and manage the CBSWM covering a cluster of contiguous barangays. WGs include women street sweepers, women informal solid waste workers, and the barangay women leaders who have been at the forefront of solid waste management (SWM) efforts in their areas for many years. Series of strategic planning workshops were launched to capacitate the WGs for them to function as key players in the system by conducting the second level of sorting and recovery at the local sorting area designated by the barangay. WGs measure wastes collected to aid in the monitoring and regulating of segregation practices at the community. WGs have significant roles in waste diversion through composting too. Notable improvements in SWM performance indicators have been achieved owing to the involvement of WGs. The existence of the WGs made collection in inaccessible areas more systematic. Its organization formalized the influential role of women. Concrete institutional arrangements and obligations to support WGs as the core unit responsible for the success of the system should be established.

Keywords: Women's group, solid waste management; community-based; sustainability; institutional arrangement

Waste Management Behavior in Indonesia: A Systematic Review

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Abstract

Indonesia faces a significant and urgent issue in waste management, ranking as the second highest country globally in terms of marine plastic debris and food lost. The behavior of the community in collecting, sorting, and processing waste is one of the factors that impacts the issue of solid waste management in Indonesia. The purpose of this article is to provide a systematic review of the studies that have been conducted on the influence of people behavior on the solid waste management systems. The data collection method in the form of a journal found on Google Scholar both in English and Bahasa Indonesia was carried out using the Harzing's Publish or Perish and Rayyan applications with the keyword's behavior and waste management in Indonesia. Based on the database search, 30 journals were found that were relevant to the topic of systematic reviews. The results of the review show that the behavior of the community in managing solid waste, including waste sorting, collection, and ultimate processing, is influenced by the knowledge, attitudes, and waste management policies. Policies have an impact on environmental behavior, community involvement. Furthermore, other variables, such as community, monthly income, consumption patterns, age, and home population density, have an impact on individuals' behavior in waste management.

Keywords: Behavior; solid waste; waste management

Designing Targeted Behavior Change Program by Utilizing Barrier Analysis of Household Waste Segregation Behavior in Urban Jakarta. Comparison between: PHINLA Project In East-North Jakarta and Kepulauan Seribu

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Abstract

Evidence-based design of behavioral change programs is critical in developing countries such as Indonesia, where households generate more than half of waste transported to landfill. Barrier Analysis study is conducted to identify targeted behavioral change interventions aimed at changing community perceptions around 12 behavioral change determinants. First, the study compares households who have already segregated their wastes (doers) and those who have not (non-doers) to identify significant behavior change determinants, which has p-value <0.05. The study's results indicate both similarities and differences among the determinants, including perceived self-efficacy, social norms, negative and positive consequences, action efficacy, perceived divine will, and policies in Jakarta mainland and Kepulauan Seribu. In Jakarta mainland, Doers are 1.6 times more likely to report participation in government policy socialization compared to Non-Doers. In Kepulauan Seribu, Doers are 2.6 times more likely to indicate that the presence of a waste bank program encourages waste segregation behavior. The study results are employed to develop targeted behavior change interventions, such as conducting Door-to-Door Education campaigns, and providing support to enhance waste segregation practice in the community. The behavior change program through PHINLA will be implemented from 2024 to 2027, with regular monitoring.

Keywords: Program design; behavioral change; solid waste management; waste segregation; barrier analysis

Evaluating Single-Use Plastic-Free Market Campaigns: A Case Study of Pasar Awam Taman Universiti, Johor Bahru

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Abstract

This study evaluates the effectiveness of the Single-Use Plastic-Free Market Campaign at Pasar Awam Taman Universiti in raising awareness and promoting behavior change among customers. The project focuses on reducing reliance on Single-Use Plastics (SUP) by assessing awareness levels and behavioral habits related to plastic use and waste management among the business operators and the market's customers. A mixed-method approach was used to collect data, including surveys and observations. Preliminary findings reveal that while awareness of plastic pollution is relatively high, significant challenges remain in changing habitual plastic use. Most customers still rely heavily on SUP bags, with more than half using over three bags per visit, indicating a strong dependence on plastic for carrying purchases. The campaign proved effective, with 52% of respondents finding the SUP-Free Market Campaign successful in reducing SUP usage and 92% supporting its continuation. This research supports Malaysia's Roadmap Towards Zero Single-Use Plastics 2018-2030, which aims to eliminate SUPs and promote sustainable alternatives. Furthermore, it offers valuable insights into strategies for reducing plastic waste in public markets, aligning with broader sustainability goals. Thus, it is recommended that future campaigns incorporate econometric analyses, such as regression modelling, to better understand the relationship between campaign implementation and behavioral change.

Keywords: Plastic-free market campaign; single-use plastics; waste management; environmental impact; community education

Reaching Inaccessible Communities: Proposed Community-Based Solid Waste Management Sub-System in Metro Manila, Philippines

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Abstract

Existing metro-wide solid waste collection system in Metro Manila consists of daily collection of biodegradable and non-biodegradable wastes by schedule through the city/municipality-contracted garbage trucks circulating the metropolitan area. However, the existing system does not cover all the streets of the metro due to the narrow alleys that comprise most of the streets in Metro Manila and has been observed to be noncompliant in following the scheduled collection of biodegradables and non-biodegradables that promotes segregation. To support the existing metro-wide collection system, a proposed community-based solid waste management sub-system was installed in selected 85 barangays of Metro Manila. The sub-system consisted of establishment of community-led collection of waste in the streets inaccessible by the contracted garbage trucks, and sorting of waste for waste diversion that generates income, before handover to garbage truck for final disposal in landfill. Results of the installed sub-system showed that several factors must be addressed to make the sub-system successful. Firstly, the community leading the sub-system faced difficulties in sustaining the everyday collection due to the small income generated from the waste diversion. Secondly, geographic size of the barangays proved to be a notable factor; the sub-system was shown to be more applicable to small barangays than large barangays due to the size of population and the size of the area to be covered. These results show that local situations and dynamics unique to each area require proactive nuancing and some degree of flexibility in programming in order for the proposed sub-system be deemed successful.

Keywords: Integrated solid waste management; solid waste management system; solid waste collection and transportation; community-based programs; Philippines

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