iCEAT2025

4TH INTERNATIONAL CONFERENCE ON **ENGINEERING AND AGRO-INDUSTRIAL TECHNOLOGY**

About iCEAT 2025

Building on the previous themes of current trends, innovation, and sustainable systems that emerged from the COVID-19 pandemic, iCEAT 2025 aims to continue discovering engineering solutions that can adapt to various contexts and requirements, helping to future-proof our society. In the face of accelerating climate change, the demand for resilient, sustainable, and low-carbon solutions has become more urgent than ever. The increasing frequency and severity of extreme weather events, combined with growing resource scarcity, challenge traditional engineering approaches to infrastructure and operations. To ensure a future that can both withstand and adapt to these global pressures, there is a critical need for innovative strategies that not only mitigate environmental impacts but also enhance the long-term resilience of our built environments.

iCEAT 2025, under the theme "Enhancing Structural Resilience, Reducing Carbon Footprint, and Integrating AI-Driven Innovations toward a Sustainable Future," seeks to address these challenges head-on by promoting cutting-edge engineering solutions that leverage artificial intelligence (AI). AI has the potential to revolutionize traditional engineering practices, providing predictive tools, real-time analytics, and optimized design capabilities that lead to smarter, more adaptive, and environmentally responsible systems. From infrastructure to operational processes, AI-driven innovations can drive significant reductions in carbon emissions, improve resource efficiency, and fortify structures against future climatic stresses.

By convening experts from academia, industry, and government, iCEAT 2025 aims to foster interdisciplinary collaboration, where key stakeholders can exchange insights, forge partnerships, and advance the integration of AI into sustainable engineering practices. The conference will serve as a platform to explore the latest trends, challenges, and opportunities in creating resilient and sustainable systems, while also producing actionable solutions that can be applied to future projects. Through these discussions, iCEAT 2025 will contribute to the global effort to build a sustainable future that is resilient, adaptive, and capable of addressing the pressing environmental challenges of our time.

iCEAT aims to push the boundaries of knowledge in adaptive engineering solutions. Contributions may delve into the multifarious world of materials engineering and agro-industrial technology – as we welcome submissions in the following topics among others:

- Chemical Engineering and Biotechnology
- Civil and Environmental Engineering
- Industrial, Systems, and Management Engineering
- Electrical, Energy, and Communication Engineering
- Material Science and Engineering
- Mechanical Engineering, Mechatronics, and Robotics
- Agricultural and Biosystems Engineering

Message from the Chancellor

JOSE V. CAMACHO JR., PhD

iCEAT's theme, "Enhancing Structural Resilience, Reducing Carbon Footprint, and Integrating AI-Driven Innovations toward a Sustainable Future," could not be more timely. As we confront global challenges like climate change, resource scarcity, and rapid technological transformation, the collective knowledge and expertise in this conference provide hope and direction for a more resilient tomorrow.

We gather at a pivotal point in history, where engineering solutions must evolve rapidly to meet the pressing climate imperatives of our age. From building infrastructure that withstands extreme weather events to designing systems that minimize environmental impact, we are called to rethink the very foundations of our industries and societies.

This conference underscores the importance of harnessing artificial intelligence as a force multiplier —one that can revolutionize traditional engineering processes, enhance predictive analytics, and bolster decision-making capabilities. By integrating AI with resilient design principles, we empower our sectors not only to adapt to a changing climate but also to mitigate its worst effects.

We recognize that truly sustainable solutions emerge when bright minds from different sectors and corners of the globe come together, exchange ideas, and build synergistic partnerships.

It is our hope that these three days of discussions, presentations, and networking will spark new collaborations, innovative research agendas, and technology-driven breakthroughs. May this conference inspire actionable ideas and strong partnerships that will shape the next chapter of engineering and agro-industrial innovation, guided by resilience, sustainability, and the power of AI.

On behalf of UPLB, I extend my deepest gratitude to everyone involved in making this event possible — our organizers, partners, and sponsors — and I wish all of you a productive and enlightening conference.

Thank you very much.

Message from the Dean

REX B. DEMAFELIS, PhD

It is my great honor and privilege to welcome you to the **4th International Conference of Engineering and Agro-industrial Technology (iCEAT 2025)**.

This year's conference, themed **"Enhancing Structural Resilience, Reducing Carbon Footprint, and Integrating AI-Driven Innovations toward a Sustainable Future,"** reflects our collective commitment to addressing some of the most pressing challenges of our time. As climate change intensifies, industries evolve, and digital transformation accelerates, the demand for sustainable and intelligent solutions has never been greater.

iCEAT 2025 serves as a vital platform for knowledge exchange, collaboration, and innovation, bringing together experts from academia, industry, and government to explore cutting-edge advancements in engineering and agro-industrial technology. Throughout this conference, we will delve into the transformative potential of **AI-driven engineering solutions, sustainable infrastructure design, and low-carbon innovations**—all of which are key to shaping a more resilient and future-proof world.

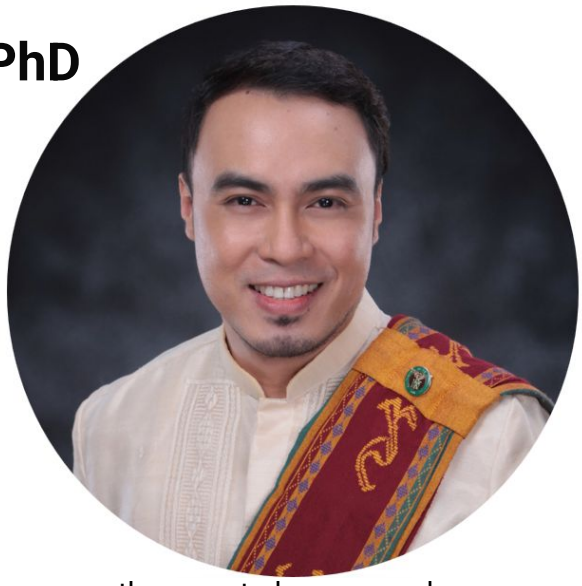
Beyond insightful discussions and groundbreaking research presentations, this event is about fostering partnerships. By working together across disciplines and sectors, we can turn ideas into action, bridging the gap between theory and real-world impact. I encourage everyone to take full advantage of this opportunity—engage with fellow participants, exchange ideas, and contribute to the meaningful conversations that will define the future of engineering and sustainability.

On behalf of the **College of Engineering and Agro-industrial Technology (CEAT), University of the Philippines Los Baños**, I extend my deepest gratitude to our speakers, organizers, and participants who have made iCEAT 2025 possible. Your dedication and expertise are what drive the success of this conference and, more importantly, the advancement of engineering and agro-industrial technology toward a sustainable and intelligent future.

With that, I officially welcome you all to **iCEAT 2025**! Let us embark on this journey of discovery, innovation, and collaboration. Thank you, and I look forward to the insightful discussions ahead.

Message from the Chair

RAMON CHRISTIAN P. EUSEBIO, PhD



We are delighted to present the Book of Abstracts for the **International Conference on Engineering and Agro-industrial Technology (iCEAT 2025)**. This year's conference brings together a diverse and dynamic community of engineers, researchers, industry leaders, and policymakers to explore the critical role of engineering in shaping a more resilient, sustainable, and low-carbon future. Under the theme, *"Enhancing Structural Resilience, Reducing Carbon Footprint, and Integrating AI-Driven Innovations toward a Sustainable Future,"* we seek to address some of the most pressing global challenges of our time.

The urgency of climate change, resource depletion, and extreme weather events have never been more apparent. As we witness increasingly severe environmental stressors – from rising temperatures to natural disasters – the need for engineering solutions that can adapt and thrive in these changing conditions is more critical than ever. In this context, iCEAT 2025 continues to build on the foundations laid in previous editions in exploring how emerging technologies and innovative engineering practices can help mitigate the effects of climate change while enhancing the resilience of our built and natural environments.

The conference highlights the profound impact of artificial intelligence (AI) in advancing the future of engineering. AI technologies have the potential to revolutionize industries by offering predictive tools, real-time data analytics, and optimized design capabilities. These innovations can lead to smarter, more adaptive systems that may not only reduce environmental impacts but may also increase the sustainability of infrastructure, processes, and operations. From AI-driven smart cities to energy-efficient manufacturing processes, the integration of AI into engineering practices is pivotal in creating systems that are more resilient, resource-efficient, and less carbon-intensive.

The increasing complexity of global challenges demands a multifaceted approach. By bringing together experts from diverse disciplines, iCEAT 2025 provides a unique platform for interdisciplinary collaboration, where research and practical solutions can be exchanged, refined, and translated into actionable outcomes. Through presentations, discussions, and networking opportunities, we aim to inspire new ideas, forge partnerships, and accelerate the integration of AI-driven innovations into engineering practices that prioritize sustainability and resilience.

The research presented in this Book of Abstracts represents the cutting edge of engineering thought and the collective effort to find solutions that can withstand and adapt to an uncertain future. We sincerely thank all the contributors for their hard work, dedication, and visionary thinking. Their efforts are shaping a future where engineering not only solves today's problems but also anticipates and addresses the challenges of tomorrow.

As we gather at iCEAT 2025, we remain committed to advancing the global dialogue around sustainability, resilience, and AI. Together, we will continue to explore solutions that support the sustainable development of infrastructure, industry, and society, and work towards building a future that is resilient, adaptive, and capable of facing the environmental challenges that lie ahead.

We hope that the ideas and innovations presented at this conference will serve as a catalyst for continued research, collaboration, and action toward a more sustainable and resilient future.

Table of Contents

Programme

March 12, 2025

Special Session on Low-Carbon Strategies

Pioneering Actions, Technologies, and Horizons for a Zero-Emission Future: ***2025 PATH to Net Zero Symposium***

08:00 - 09:00	Registration
09:00 - 09:10	Welcome Address
09:10 - 09:20	Opening Remarks
09:20 - 09:50	**Keynote Message: AIST'S Challenges for Achieving Carbon Neutrality (on-site)** ***Dr. Yuki Kudoh*** *Deputy Director, Global Zero Emission Research Center (GZR), National Institute of Advanced Industrial Science and Technology (AIST), Japan*
09:50 - 10:10	Health Break and Networking
10:10 - 10:35	**TOPIC 1: Ayala Land's Green Development and Sustainability Initiatives (on-site)** ***Ms. Anna Maria M. Gonzales*** *Head of Corporate Sustainability, Ayala Land, Philippines*
10:35 - 11:00	**TOPIC 2: Sustainable Infrastructure Design: Integrating LCA with Green Building Certifications (on-site)** ***Mr. Emelito Punsalan*** *Chairman, GREEEN Rating System* *GREEEN ADP+AA, EDGE* *Philippine Green Building Initiative (PGBI), Philippines*
11:00 - 11:25	**TOPIC 3: Carbon Emissions Reduction around Asia Pacific Region (with focus on CCUS) (virtual)** ***Engr. Cesar L. Abaca, Jr.*** *Lead Project Engineer, Chiyoda Corporation, Japan*
11:25 - 11:55	Open Forum/Panel Discussion
11:55 - 12:00	Awarding of Certificates to Resource Speakers
12:00 - 01:30	Lunch Break
01:30 - 02:00	**Keynote Message: From Compliance to Leadership: Achieving Sustainable Growth through Harmonized Standards (on-site)** ***Dr. Jessica Hanafi*** *Co-Convenor ISO TC 207/Steering Committee 5/WG 12* *Founder and Executive Director, PT Life Cycle Indonesia*
02:00 - 02:30	**TOPIC 4: Sustainability Analytics: Transforming Companies for a Net-Zero Future (virtual)** ***Mr. Aakash Kumar Gupta*** *Senior Manager, Sustainability Analytics Services* *Sustainable1, S&P Global, India*
02:30 - 03:00	**TOPIC 5: Transforming Waste into Resources for Circular Low Carbon Future (on-site)** ***Dr. Michael Angelo B. Promentilla*** *Professor and Head of Waste and Resource Management Unit* *Center for Engineering and Sustainable Development Research* *De La Salle University - Manila, Philippines*
03:00 - 03:30	Health Break and Networking

Programme

March 12, 2025

03:30 - 04:00	**Topic 6: Fly Net Zero (On-site)** ***Prof. Wei-Cheng Wang*** *Full Professor* *Department of Aeronautics and Astronautics* *National Cheng Kung University, Taiwan*
04:00 - 04:40	Open Forum/Panel Discussion
04:40 - 04:45	Awarding of Certificates to Resource Speakers
04:45 - 05:00	Synthesis and Closing Remarks

March 13, 2025

Conference Proper

08:00 - 08:30	Registration
08:30 - 08:45	**Opening Remarks** ***Prof. Jose V. Camacho, Jr., PhD*** *Chancellor, University of the Philippines Los Baños*
08:45 - 09:00	**Welcoming Message** ***Prof. Rex B. Demafelis, PhD*** *Dean, College of Engineering and Agro-industrial Technology* *University of the Philippines Los Baños*
09:00 - 09:45	**Keynote Address (On-site)** ***Prof. Raymond Girard R. Tan, PhD*** *Full Professor, De La Salle University* *Manila, Philippines*
09:45 - 10:30	**Plenary Session 1 (Hybrid)** ***Prof. Kenneth Gavin, PhD*** *Professor, Delft University of Technology* *Delft, Netherlands*
10:30 - 10:45	Health Break and Networking
10:45 - 11:30	**Plenary Session 2 (Hybrid)** ***Prof. Hiroe Hara-Yamamura, PhD*** *Associate Professor, Kanazawa University* *Kanazawa, Japan*
11:30 - 01:00	Lunch Break
01:00 - 05:45	**Parallel Sessions 1, 2, 3, 4 (Hybrid)** Advancing Sustainable Infrastructure and Mobility Intelligent Systems for Resource Management Waste Treatment and Resource Recovery Environmental Monitoring and Management

Programme

March 14, 2025

Conference Proper

08:00 - 08:30	Recap of Day 1
08:30 - 09:00	**Plenary Session 3 (On-site)** ***Dr. Julius Marvin V. Flores, CPEng*** *Senior Researcher, Moojin, South Korea* *Founder, PAVEx, Manila, Philippines*
09:00 - 09:30	**Plenary Session 4 (Hybrid)** ***Dr. Karl Ezra S. Pilario*** *Associate Professor, University of the Philippines Diliman* *Quezon City, Philippines*
09:30 - 10:00	**Plenary Session 5 (On-site)** ***Dr. Tonni Agustiono Kurniawan*** *Visiting Professor, Polytechnic of Health* *Indonesia*
10:00 - 10:30	Open Forum
10:30 - 11:30	**Technical Session**
11:30 - 01:10	Lunch Break
01:10 - 02:25	**Technical Session**
02:25 - 02:45	**Sponsor Presentation**
02:45 - 04:15	**Poster Presentation Session**
04:15 - 04:30	Health Break & Networking
04:30 - 05:00	**Awarding and Closing Remarks** ***Dr. Ramon Christian P. Eusebio*** *Chair, iCEAT 2025 Organizing Committee*

March 15, 2025

Local Community Tour

Parallel Sessions

March 13, 2025

Advancing Sustainable Infrastructure and Mobility

Parallel Session 1 (Drilon Hall)	Session Chair:	Paolo Rommel P. Sanchez, PhD
	Session Co-Chair:	Biplab Das, PhD
	Session Co-Chair:	Tiffany Louise B. Lao, CMatE
	Session Co-Chair:	Marloe B. Sundo, PhD
	Moderator:	Edward Joseph H. Maguindayao, REE
13:00 - 13:40	**Keynote Speech:**	**Clodualdo Aranas Jr., PhD** Department of Mechanical Engineering University of New Brunswick, Canada
13:40 - 14:20	**Keynote Speech:**	**Albert Causo, PhD** CEO & Co-founder: Hand Plus Robotics PTE. LTD Director & Co-founder, Algorhythm Robotics Center
Sub-Theme: Sustainable Materials and Construction		
14:20 - 14:35	**PS1-1** | *A Comparative Analysis of Bamboo-derived Wood and Recycled Plastic Composite in Marilog, Davao City* | LK Soriano, PJA Mangulabnan, SLB Popatco, & **NLR Boloron**	
14:35 - 14:50	**PS1-2** | *Process Optimization of Flax Fiber Composite Production for Indoor and Outdoor Applications* | RAB Delicano, **DMR De Silva**, GJL de Leon, AP Opaco, & MMD Lu	
14:50 - 15:05	**PS1- 3** | *Experimental Study on the Relationship between Concrete Cover Thickness and Surface Quality* | Y Yagi, T Kamada, & A Ueno	
15:05 - 15:20	**PS1-4** | *Correlation Assessment of Strength of Concrete and Reinforcing Bars, and Type of Concrete Mix Method in Structural Construction Material Cost for a Simple 3D Concrete Frame subjected to Code-based Loadings and Design* | **NAA Morada**	
15:20 - 15:25	**5 - minute break**	
15:25 -15:40	**PS1-5** | *Compressive Strength and Binder Intensity Prediction in Concrete Mixes using a Customized Neural Network with Explainability* | AK Patra, Y Tamut, & S Mishra	
15:40 - 15:55	**PS1-6** | *Sustainable Cooling Solutions: Evaluation of Honeycomb-Structured PVC Pipe-Based Air-Cooling System* | KP Ferraro, MK Duran, **B De Guzman**, & J Sabido	
Sub-Theme: Transportation and Logistics		
15:55 - 16:10	**PS1-7** | *Fuel Consumption among Public Utility Jeepney in Laguna, Philippines* | MLR Alvarez, **JN Garcia, & JMD Aquino**	
16:10 - 16:25	**PS1-8** | *Using Systems Simulation in Assessing the Impact of Road Widening on the Level of Service and Travel Time at the University of the Philippines Los Baños* I **JF Larong**, JM Velacruz, MT Caya, & GJ de Leon	
16:25 -16:40	**PS1-9** | *Development of an Adaptive Vibration Monitoring System for Automotive Applications* | **CN Romero**	
16:40-16:45	**5 - minute break**	
16:45 - 17:00	**PS1-10** | *A Comparative Life Cycle Assessment of Public Bus Technology Alternatives: Case Study of Auckland, New Zealand* | RH Risqianto & **F Reguyal**	
17:00 - 17:15	**PS1-11** | *Reinforcing Earthquake Response: Equitable Disaster Relief Shelter Distribution Through Intermodal Transportation* | **CC Cuento**, GJ De Leon, MD Lapitan, ML Eusebio, & JA Galang	
17:15 - 17:30	**PS1-12** | Developing an Excel-Based Route Planning System for Agricultural Products Pickup and Delivery in Benguet, Philippines | AE Ruiz, KI Roquel, & M Maniquiz-Redillas	
17:30 - 17:45	**PS1-13** | Examining Vehicular Accident Pattern Along National Highway 66 in Alappuzha District, Kerala, India | **D Pal** & S Sreenivasulu	

Parallel Sessions

March 13, 2025

Intelligent Systems for Resource Management		
Parallel Session 2 (IPM Room)	Session Chair: Session Co-Chair: Session Co-Chair: Moderator:	Ronaldo B. Saludes, PhD Rubenito M. Lampayan, PhD Ven Rem Bill A. Pasion, CIE Stephanie Caridad D. Landicho
13:00 - 13:40	**Keynote Speech:**	**Rex Robielos, PhD** Senior Manager Project Management Office, Business Intelligence and Analytics, Analog Devices Inc., Philippines
Sub-Theme: Agricultural Technology and Innovation		
13:40 - 13:55	**PS2-1** | *Assessment of Food-Grade Metal Safety in Agricultural Machinery: Residual Contamination in Processed Agricultural Commodities* | **MRE Nanali**, AL Fajardo, & OF Zubia	
13:55 - 14:10	**PS2-2** | *Design and Development of a Trailed-type Dynamometer for Tractor Drawbar Force Measurement* | **RP Santiago**, AL Fajardo, & RE Eusebio	
14:10 - 14:25	**PS2-3** | *Physiological Responses of Farm Tractor Operators During Ronnie Baugh Tractor (Oggun II) Operation at Different Speeds and Terrains* | **JFC Marcelo**, JKP Punongbayan, AMS Mercado, DMR De Silva, & JAD Revilla	
14:25 - 14:40	**PS2-4** | *Designing a Decision-Support System Architecture for Career Selection: A Case Study at the University of the Philippines* | **KD Vinluan**, MLC Eusebio, VBA Pasion, KL Baldoz, LA Mariano, & MM Punzalan	
14:40 - 14:55	**PS2-5** | *Experimental Investigation on the Drying Performance and Environmental Assessment of a 3-tiered Single Slope Solar Greenhouse Dryer* | S Borkakoti & B Das	
14:55 - 15:00	**5 - minute break**	
15:00 - 15:15	**PS2-6** | *Computer Vision-Based Classification of Waxed and Unwaxed Satsuma Mandarins* | **JC Quipo**, AA Borja, & AL Fajardo	
15:15 - 15:30	**PS2-7** | *Human-Centered Graphical User Interface and System Design of a Mobile Application on Digitizing Farm-to-Table Operations* | **PL Perocho**, NJ Suganob, R Concepcion II, J Del-Amen, & M Maniquiz-Redillas	
15:30 -15:45	**PS2-8** | *Small-Scale Evaporative Cooler Utilizing Dried Corn Cobs as Cooling Pad Extends Shelf Life of 'Mucho' Eggplants (Solanum melongena L.)* | **JI Nuica**, HMA Miguel, DMC Manalo, RNS Mestosamente, JGG Lontoc, JRP Arabaca, MCG Acabal, AJD Rodeo, & RAO Lualhati	
15:45 - 16:00	**PS2-9** | *Experimental dynamic analysis of a rotating flexible kink robotic link* | P Chetia, AM Sodial, & **S Mahto**	
16:00 - 16:15	**PS2-10** I *Post-Harvest Technology Management System of Selected Fruits for Export* | **AR Zabala**	
16:15 - 16:20	**5 - minute break**	
Sub-Theme: Data Analytics and Decision Support Systems		
16:20 - 16:35	**PS2-11** | *Rapid Classification of Cohesionless Soils Using Convolutional Neural Networks on Soil Images* | **MAR Dela Peña**, BDP Papasin, AC Cruz, CB Borja, & RG Zafra	
16:35 - 16:50	**PS2-12** | *Comparative Study Between Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) with Sensitivity Analysis for Suitability Mapping of Constructed Wetlands in Negros Oriental, Philippines* | **JRL Macaranas**, PP Velasco, KAP Carurucan, & JAR Sabio	
16:50 - 17:05	**PS2-13** | *Prepositioning Disaster Relief Supplies in Region V, Philippines Using Two-Stage Stochastic Optimization* | **GEL Remo**, AC Ani, GJL De Leon, & JKP Punongbayan	
17:05 - 17:20	**PS2-14** | *Design and Integration of a UV Sterilizer System Utilizing Spectrophotometry for Algae Detection in Hydroponics* | **MJI Encanto**, CPR Esteban, & MR Martinez-Goss	

Parallel Sessions

March 13, 2025

Waste Treatment and Resource Recovery

Parallel Session 3 (Sam-Arng Room A)	Session Chair:	Michael Vincent O. Laurio, PhD
	Session Co-Chair:	Flocerfida L. Amaya, PhD
	Session Co-Chair:	Jovita L. Movillon, Professor Emeritus
	Moderator:	Mart Merwin C. Magboo, MSc
14:30 - 14:45	**PS3-1** | *Model Development in the Assessment of Sludge Accumulation Rate and Desludging Interval of Domestic Septic Tanks in the Philippines* | **JGR Cubias**, PP Velasco, LB Lapastora, & JF Ronquillo	
14:45 - 15:00	**PS3-2** | *Optimization of Hydrolysate Production from Sargassum spp. for Polyhydroxyalkanoates (PHA) Production* | **JP Lawas**, JU Tulipan, JRC Unlayao, MG Borines, & JS Ventura	
15:00 - 15:15	**PS3-3**| *Optimization of Hydrolysate Production from Caulerpa spp. for Polyhydroxyalkanoate Production* | **JJC Ramos**, JU Tulipan, JRC Unlayao, MG Borines, & JS Ventura	
15:15 - 15:30	**PS3-4** | *Development of Decision Tool for Sorting Municipalities Among Centralized, Decentralized, And On-site Wastewater Treatment Systems Using Analytic Hierarchy Process Sorting II Method in the Philippines* | **RCG Sinon**, PP Velasco, MAB Promentilla, KAP Carurucan, & LB Lapastora	
15:30 - 15:35	**5 - minute break**	
15:35 - 15:50	**PS3-5** | *The Effects of Temperature on Biogas Production and Purity* | RNZ Rimorin, CMM Felix, & **RJL De Vela**	
15:50 - 16:05	**PS3-6** | *Optimization of Nutrient Conditions for Enhanced Polyhydroxyalkanoate (PHA) Bioplastic Production in Pseudomonas putida KT2440 Using Coconut Oil* | **A Banawa**, JU Tulipan, MCM Detras, & JS Ventura	
16:05 - 16:20	**PS3-7** I *Optimizing Polyhydroxybutyrate Bioplastic Production by Cupriavidus necator KCTC 2649 Using Potato Peel Waste-Derived Starch Hydrolysates* | **JRO Dioneda**, JU Tulipan, MMC Magboo, & JS Ventura	
16:20 - 16:35	**PS3-8** | *Photocatalytic Degradation of Phenanthrene using Visible Light–Active Sb_2S_3–TiO_2 Composite Particles* | **ML Torres** & JA Mendoza	
16:35 - 16:40	**5 - minute break**	
16:40 - 16:55	**PS3-9** | *Effect of Initial pH, Initial Concentration and Current Intensity on Ciprofloxacin Removal from Pharmaceutical Water using Homogeneous Electro Fenton* | **KA Sadol**, BG Bueno, J Capingian, CL Aquino, KN Rodriguez, LR Somera, J Cornista, LM Dalmacio, RC Eusebio, A Orbecido, J Ortenero, SA Pagsuyoin, L Patacsil, MA Promentilla, MA Salazar, & A Beltran	
16:55 - 17:10	**PS3-10** | *Development of Polyethersulfone Membrane Embedded with Kappa-Carrageenan Derived Carbon Nanodots and its Potential for Cadmium (II) Removal from Water* | **JBG Permato**, MMC Magboo, BG Bataller, MVO Laurio, RCP Eusebio	
17:10 - 17:25	**PS3-11** | *Ciprofloxacin removal using Homogeneous Photo-Fenton Process: Investigation on Optimal Operating Parameters* | BG Bueno, KA Sadol, **GM Arada**, J Capingian, CL Aquino, KN Rodriguez, LR Somera, J Cornista, LM Dalmacio, RC Eusebio, A Orbecido, J Ortenero, SA Pagsuyoin, L Patacsil, MA Promentilla, MA Salazar, & A Beltran	
17:25 - 17:40	**PS3-12** | *Evaluation of Cadmium Removal from Landfill Leachate using Zeolitic Permeable Reactive Barrier (PRB)* | AMS Capiroso, NR Salomon, RCP Eusebio, RRR Sazon, LCM Buela, & **BG Bataller**	

Parallel Sessions

March 13, 2025

Environmental Monitoring and Management

Parallel Session 4 (Sam-Arng Room B)	Session Chair:	Rico C. Ancog, PhD
	Session Co-Chair:	Janice B. Sevilla-Nastor, PhD
	Session Co-Chair:	King Harold A. Recto, PhD
	Moderator:	Carmina B. Borja, MSc
14:00 - 14:15	**PS4-1** | *Design and Performance Evaluation of An Alternative Redox Battery Using Different Electroactive Materials in a Chlorine-Diluted Solution for Powering a Thermoelectric Peltier Cooler* | **NL Boloron**, JDS Golosino, KN Quieta, CJF Rabia, EJG Selgas, VG Celis, & DI Oppus	
14:15 - 14:30	**PS4-2** | *Carbon Footprint Assessment of Recirculating Tank and Pond Systems for African Catfish (Clarias gariepinus) in Sta. Cruz, Laguna, Philippines* | **AU Gipanao**, RB De Los Reyes, RB Saludes, & RM Lampayan	
14:30 - 14:45	**PS4-3** | *Characterizing Occupational Noise and Workers' Exposure Levels in a Coconut Manufacturing Plant: A Case Study in Company XYZ in San Pablo City, Laguna, Philippines* | **GAD Buera**, SCDR Landicho, MLC Eusebio, VBA Pasion, & JAD Revilla	
14:45 - 15:00	**PS4-4** | *Water Footprint Comparison of Constructed Wetlands for Wastewater Treatment Using Different LCI Databases* | S Cho, MJ Choi, SC Kim, & J Park	
15:00 - 15:15	**PS4-5** | *Assessing a digital image-based agricultural monitoring system using VTOL unmanned model aircraft* | **I Irwansyah**, RA Syahputra, & F Jayadi	
15:15 - 15:20	**5 - minute break**	
15:20 - 15:35	**PS4-6** | *NATROSENSOR: A Web-Based Application for Detecting, Reporting, and Monitoring Antibiotic Residues in Wastewater* | **JAT Targaza**, DWB Libunao-Bueta, GR Panghulan, FRC Bueta, ILE Gonzaga, & RL Reaño	
15:35 - 15:50	**PS4-7** | *Performance and Degradation Assessment of Solar Photovoltaic Modules in the Department of Electrical Engineering of the University of the Philippines – Los Baños* | **RC Ibarra** & CPR Esteban	
15:50 - 16:05	**PS4-8** | *A Systematic Review of Current Instruments in Predicting Seismic Activities* | **CJ Bumagat**, ZM Mater, A Queppet, JBM Terrible, & JDB Escaño	
16:05 - 16:20	**PS4-9** | *Enhancing Coastal Urban Resilience through Sustainable Flood Solutions in Catbalogan City using HEC-RAS 2D* | **JT Reyes**, MA Duka, LCM Buela, RA Luyun Jr.	
16:20 - 16:25	**5 - minute break**	
16:25 - 16:40	**PS4-10** | *Mapping Current Trends in the Use of Industrial Waste for Enhanced Weathering: A Systematic Literature Review via Co-word Analysis* | **CZ Reyes** & MVM Sumagang	
16:40 - 16:55	**PS4-11** | *Wastewater Management Policies and Antibiotic Pollution in The Philippines: A Systematic Review* | **J Capingian**, B Bueno, K Sadol, KN Rodriguezm LR Somera, CL Aquino, J Cornista, LM Dalmacio, RC Eusebio, A Orbecido, J Ortenero, SA Pagsuyoin, L Pataczil, MA Promentilla, MA Salazar, & A Beltran	
16:55 - 17:10	**PS4-12** | *Modeling of the Impact of Pumping Rate and Recharge Rate on the Saltwater Intrusion in Cataingan, Masbate Using MODFLOW and SWI2* | **CB Losito**, BG Bataller, MMC Magboo, MV Ligaray, & RCP Eusebio	
17:10 - 17:25	**PS4-13** | *Nutrient Transport Model Simulation: Nitrate and Phosphate Distributions from a Seaweed Farm in Bongao, Tawi-Tawi, Philippines* | **MAE Pascua**, MV Ligaray, BG Bataller, MMC Magboo, & RCP Eusebio	
17:25 - 17:40	**PS4-14** | *Analyzing the Stormwater Quantity and Quality in a Residential Area Using Green-Grey Ratio* | D Lopez, R Manaloto, L San Juan, R Koch, S Garbanzos, M Maniquiz-Redillas	

Technical Sessions

March 14, 2025

Technical Sessions		
Technical Session (Umali Hall)	Session Chair: Moderator:	Marish S. Madlangbayan, PhD Butch G. Bataller, PhD
10:30 - 10:50	**TP-1** ***Optimization and Sensitivity Analysis of Cell Separation in Serpentine Channels of Microfluidic Centrifuge using FLUENT and Response Surface Methodology (RSM)*** Ruen Rey R. Sazon and Butch G. Bataller	
10:50 - 11:10	**TP-2** ***Identification of DNA-based Aptamer Against Beta-Lactam Antibiotics using Molecular Docking Simulation*** Marjhun Christianee B. Galanido, Caren R. Tumambing, Vincent Paul P. Laguardia, Ian Lorenzo E. Gonzaga, Felix Rey C. Bueta, Glenson R. Panghulan, Donna Wren B. Libunao-Bueta, & Resmond L. Reaño	
11:10 - 11:30	**TP-3** ***Analysis of Barriers to Domestic Reclaimed Water Use in Metro Manila using Hierarchical DEMATEL and BWM*** Joshua Bon A. Roco & Michael Angelo B. Promentilla	
11:30 - 13:10	**LUNCH BREAK**	
13:10 - 13:30	**TP-4** ***Rapid Moisture Content Determination of Coarse-Grained Soil by Image Processing using Machine Learning Techniques*** Mark Jay-Ar D. Devilleres, Andre C. Cruz, Carmina B. Borja, Richelle G. Zafra, & Bien Dave Papasin	
13:30 - 13:50	**TP-5** ***3D Printed Adsorbents using Activated Biochar derived from Sugarcane Bagasse for Ciprofloxacin Removal in Wastewater*** Lemuel Joshua B. Ubiña, Rowlan Joseph A. Guia, Christian Laurence E. Aquino, Lester Raj A. Somera, Mary Donnabelle L. Balela, & Liza Bautista-Patacsil	
13:50 - 14:10	**TP-6** ***Bayesian Approach to Hyperparameter Optimization of Gaussian Process Surrogate Models in Geotechnical Engineering*** Ron Gabriel Navarro	
14:10 - 14:25	**TP-7** ***Integrating Autoclaved Aerated Concrete in Construction for Greener and Earthquake-Resilient Buildings*** Jennifer H. Latoga	

Poster Sessions

March 14, 2025

14:30-16:00 | SAM-ARNG ROOM

PP-1 | *Bio-Based Crack Solution: Utilizing Bacillus Megaterium For Concrete Crack Treatment* | **KC Biñas**, J Judillasen, JJ Duero, KW Marfil, & JE Belencion

PP-2 | *Determination of the Physical and Mechanical Properties of Garlic (Allium sativum L.)* | **NA Equiab Jr.** & AL Fajardo

PS2-1 | *Assessment of Food-Grade Metal Safety in Agricultural Machinery: Residual Contamination in Processed Agricultural Commodities* | **MRE Nanali**, AL Fajardo, & OF Zubia

PS1-7 | *Fuel Consumption among Public Utility Jeepney in Laguna, Philippines* | MLR Alvarez**, JN Garcia, & JMD Aquino**

PS4-1 | *Design and Performance Evaluation of An Alternative Redox Battery Using Different Electroactive Materials in a Chlorine-Diluted Solution for Powering a Thermoelectric Peltier Cooler* | **NLR Boloron**, JDS Golosino, KN Quieta, CJF Rabia, EJG Selgas, VG Celis Jr., & DI Oppus

PS1-1 | *A Comparative Analysis of Bamboo-derived Wood and Recycled Plastic Composite in Marilog, Davao City* | LK Soriano, PJA Mangulabnan, SLB Popatco, & **NLR Boloron**

PP-3 | *IoT-based Storage Time Prediction of Raw Chicken Via Reflectance Spectrometry: Comparison of Generalized Linear (GLM) and Machine Learning (ML) Models* | JF Eboña, A Jumawan, M Majhi, D Sahu, K Pal, & **F Flores**

PS4-2 | *Carbon Footprint Assessment of Recirculating Tank and Pond Systems for African Catfish (Clarias gariepinus) in Sta. Cruz, Laguna, Philippines* | **AU Gipanao**, RB De Los Reyes, RB Saludes, & RM Lampayan

PS-12 | *Comparative Study Between Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) with Sensitivity Analysis for Suitability Mapping of Constructed Wetlands in Negros Oriental, Philippines* | **JRL Macaranas**, PP Velasco, KAP Carurucan, & JAR Sabio

PP-4 | *Performance Characterization of Heater-Air Mechanical Grain Dryers Tested by the Agricultural Machinery Testing and Evaluation Center, Philippines* | AL Fajardo, **DJT Maglal-lan**, YMM Pinca

PS4-5 | *Assessing a digital image-based agricultural monitoring system using VTOL unmanned model aircraft* | **I Irwansyah**, RA Syahputra, & F Jayadi

PP-5 | *Effectivity of Coconut Coir-Derived Hydrophobic Coating as a Corrosion Inhibitor for Steel Rebars in Reinforced Concrete* | **BLP Espinoza**, **SIM Regino**, EV Estante, & ERS Yanza

TP-1 | *Optimization and Sensitivity Analysis of Cell Separation in Serpentine Channels of Microfluidic Centrifuge using FLUENT and Response Surface Methodology (RSM)* | *RRR Sazon & Butch G. Bataller*

PP-6 | *Development of a Wheel Slippage Measurement System for Four-wheel Agricultural Tractors* | **RMC Albalos**, AL Fajardo, VRM Madrid, OF Zubia, & EP Quilloy

PS4-8 | *A Systematic Review of Current Instruments in Predicting Seismic Activities* | **CJ Bumagat**, ZM Mater, A Queppet, JBM Terrible, & JDB Escaño

PS1-11 | *Reinforcing Earthquake Response: Equitable Disaster Relief Shelter Distribution Through Intermodal Transportation* | **CC Cuento**, GJ De Leon, MD Lapitan, ML Eusebio, & JA Galang

Poster Sessions

March 14, 2025

14:30-16:00 | SAM-ARNG ROOM

PS3-5 | *The Effects of Temperature on Biogas Production and Purity* | RNZ Rimorin, CMM Felix, & **RJL De Vela**

PS4-10 | *Mapping Current Trends in the Use of Industrial Waste for Enhanced Weathering: A Systematic Literature Review via Co-word Analysis* | **CZ Reyes** & MVM Sumagang

PS3-6 | *Optimization of Nutrient Conditions for Enhanced Polyhydroxyalkanoate (PHA) Bioplastic Production in Pseudomonas putida KT2440 Using Coconut Oil* | **A Banawa**, JU Tulipan, MCM Detras, & JS Ventura

PS3-7 I *Optimizing Polyhydroxybutyrate Bioplastic Production by Cupriavidus necator KCTC 2649 Using Potato Peel Waste-Derived Starch Hydrolysates* | **JRO Dioneda**, JU Tulipan, MMC Magboo, & JS Ventura

PS3-8 | *Photocatalytic Degradation of Phenanthrene using Visible Light–Active Sb_2S_3–TiO_2 Composite Particles* | ML Torres & JA Mendoza

PS3-10 | *Development of Polyethersulfone Membrane Embedded with Kappa-Carrageenan Derived Carbon Nanodots and its Potential for Cadmium (II) Removal from Water* | **JBG Permato**, MMC Magboo, BG Bataller, MVO Laurio, RCP Eusebio

PS2-14 | *Design and Integration of a UV Sterilizer System Utilizing Spectrophotometry for Algae Detection in Hydroponics* | **MJI Encanto**, CPR Esteban, & MR Martinez-Goss

PS4-12 | *Modeling of the Impact of Pumping Rate and Recharge Rate on the Saltwater Intrusion in Cataingan, Masbate Using MODFLOW and SWI2* | **CB Losito**, BG Bataller, MMC Magboo, MV Ligaray, & RCP Eusebio

PS4-13 | *Nutrient Transport Model Simulation: Nitrate and Phosphate Distributions from a Seaweed Farm in Bongao, Tawi-Tawi, Philippines* | **MAE Pascua**, MV Ligaray, BG Bataller, MMC Magboo, & RCP Eusebio

PP-7 | *Evaluating Sediment Yield and Erosion Risk in an Urban Catchment Based on Land Cover using SWAT* | KJ San Pedro, EJ Villareal, S Garbanzos, J Cayetano, R Antonio Jr., & M Maniquiz-Redillas

PP-8 | *Assessment of the Efficiency of Bioretention Cells in a Tropical Catchment through Simulation Analysis* | JRV Macalalad & M Maniquiz-Redillas

PS1-6 | *Sustainable Cooling Solutions: Evaluation of Honeycomb-Structured PVC Pipe-Based Air-Cooling System* | KP Ferraro, MK Duran, **B De Guzman**, & J Sabido

PP-9 I *Decentralized Approach to Domestic Water Management Systems in Developing Countries: A Systematic Review and Policy Recommendations* | DG Damalerio, JMV Pascual, MD Sajonas, JD Capingian, GMG Arada, MAB Promentilla, AH Orbecido, RMT Tanhueco, KB Aviso, & AB Beltran

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4TH INTERNATIONAL CONFERENCE ON
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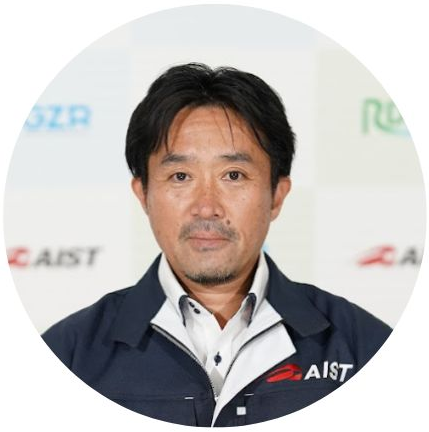
Bionotes of the Keynote, Plenary, and Parallel Speakers

Keynote Speakers

Raymond Girard R. Tan, PhD

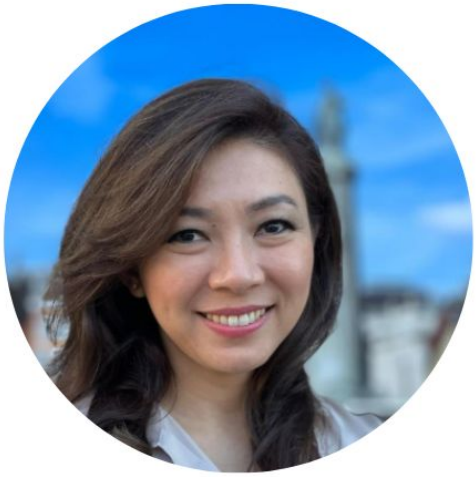
Raymond R. Tan is a Distinguished Full Professor of the Department of Chemical Engineering, a University Fellow, and the current Vice President for Research and Innovation of De La Salle University. He is a Fellow of The World Academy of Sciences and an Academician of the Philippine National Academy of Science and Technology. His research focuses on the development and use of models for improving the sustainability of industrial systems. Prof. Tan is best known as the co-developer of the carbon emissions pinch analysis algorithm. In the Scopus database, he has close to 600 publications with over 15,000 citations and an h-index of 60. Heis an editor-in-chief of *Process Integration and Optimization for Sustainability*, an associate editor of *Sustainable Production and Consumption*, and an editorial board member of other journals (e.g., *Clean Technologies and Environmental Policy*; *Chemical Engineering Transactions*; and *Cleaner Engineering and Technology*). He has received multiple scientific awards from various organizations in the Philippines, has been listed in the Scopus database of the top 2% of scientists in the world since 2019, and is in the Reuters "Hot List" of the world's 1,000 most influential climate researchers.

Yuki Kudoh, PhD



Dr. Yuki Kudoh is the Deputy Director of the Global Zero Emission Research Center at Japan's National Institute of Advanced Industrial Science and Technology. He earned his Ph.D. in geosystem engineering from the University of Tokyo and has a background in environmental and energy systems research. His expertise lies in analyzing low-carbon technologies and their integration into society using systems engineering and life cycle assessment. His recent work focuses on pathways for deploying clean energy solutions to achieve carbon neutrality. He is also a Visiting Professor at Yokohama National University

Jessica Hanafi, PhD



Dr. Jessica Hanafi is a leading expert in life cycle engineering, specializing in reverse logistics, sustainable manufacturing, and supply chains. She is the founder and director of **Life Cycle Indonesia**, the country's first consulting firm dedicated to Life Cycle Assessment and sustainability management. As **Co-Executive Director of the Indonesia Cleaner Production Centre**, she supports national efforts in resource efficiency. She has worked with organizations like **UN Environment, UNIDO, and Bappenas** and played a key role in adopting Indonesian standards for Life Cycle Assessment. She actively contributes to Indonesia's circular economy roadmap and provides training on sustainability reporting.

Plenary Speaker

Mr. Aakash Gupta

Aakash Gupta is a seasoned ESG Analyst with over 12 years of experience in sustainability strategy, non-financial disclosures, ESG assessments, public policy advocacy, and assurance. He has worked across diverse industries, including cement, real estate, mining, IT, and hospitality, supporting clients globally. Beginning his career as a software engineer in the US healthcare insurance domain, he later transitioned to environmental policy advocacy with the Government of India. He also worked in the Climate Change division of a Big Four firm, leading ESG projects for corporate clients.

Michael Angelo B. Promentilla, PhD

Dr. Michael Angelo B. Promentilla is a Professor of Chemical Engineering at De La Salle University (DLSU) and the founding head of the Waste and Resource Management Unit at the Center for Engineering and Sustainable Development Research. His research spans decision modeling, risk analysis, sustainable materials, and environmental systems, with a focus on geopolymers and climate-smart infrastructure. He has led major research programs like Green Mining and NexCities and has collaborated with DOST, ASEAN, and NRCP on sustainability initiatives. A recipient of numerous awards, including NAST's Outstanding Young Scientist, he has over 150 publications and actively mentors young researchers through the G.A.M.E.R.S. Lab at DLSU.

Prof. Wei-Cheng Wang, PhD

Prof. Wei-Cheng Wang obtained his Ph.D. in North Carolina State University, NC, USA. After doctoral degree, he worked as a researcher in National Renewable Energy Laboratory (NREL), CO, USA for 2 years. In 2014, he joined the Department of Aeronautics and Astronautics, National Cheng Kung University, Taiwan. The research interests of Prof. Wang are fuel and combustion, and his research goal is to promote Fly Net Zero.

Plenary Speaker

Ms. Anna Maria Gonzales

Anna Maria M. Gonzales has been the Head of Sustainability at Ayala Land since 2022, leading initiatives that drive environmental and social impact for the Philippines' top property developer. She oversees the company's carbon neutrality program, sustainable planning, and carbon forest management while ensuring business units integrate Ayala Land's sustainability priorities. An architect, environmental planner, and Certified BERDE Professional, Anna previously led a non-profit supporting rural and urban communities and worked in government housing policy. She holds degrees from the University of the Philippines and the Institute of Housing and Urban Development Studies in Rotterdam and was a Hubert Humphrey Fellow at Rutgers University.

Ar. Emelito Punsalan

Experienced Quality Representative with a demonstrated history of working in the Architecture, Green Building and HVAC engineering industry. GREEEN Design Professional and Assessor. EDGE Certifier. BeQ. Skilled in AutoCAD, HVAC, Building Energy Modeling, Computer-Aided Design (CAD), and Urban Planning. Strong arts and design professional with a Bachelor of Science (BS) focused in Architecture from University of the Philippines.

Engr. Cesar L. Abaca Jr.

Mr. Abaca is a seasoned chemical and process engineer with 23 years of experience in engineering, procurement, and construction (EPC) for the oil & gas, petrochemical, and industrial maintenance sectors. He has spent 16 years in project engineering and management, collaborating with multidisciplinary teams, vendors, and international clients. With a strong background in wastewater treatment, he has led major projects, including Pre-FEED and FEED phases. His expertise also includes seven years in construction management, pre-commissioning, and commissioning, along with proficiency in Advance Work Packaging (AWP), proposal preparation, cost estimation, and project execution.

Plenary Speakers

Kenneth Gavin, PhD

Prof. Kenneth Gavin graduated with a bachelor's degree in civil engineering from Queens University Belfast and a PhD on Offshore Geotechnics from Trinity College Dublin in 1998. Since then, he has combined an academic career with consulting practice. He has won over € 10,000,000 in competitive research funding in the fields of climate impacts on infrastructure and offshore wind and coordinated 5 large EU Collaborative Projects, and several National Projects. He is the head of the Delft Offshore Geotechnics Research Group and supervises 15 PhD and 4 Post-Doc students. He is co-founder and lead geotechnical engineer of the company INGEO2 who are engaged in projects across the globe including offshore wind farms, port developments and major tunnels.

Hiroe Hara-Yamamura, PhD

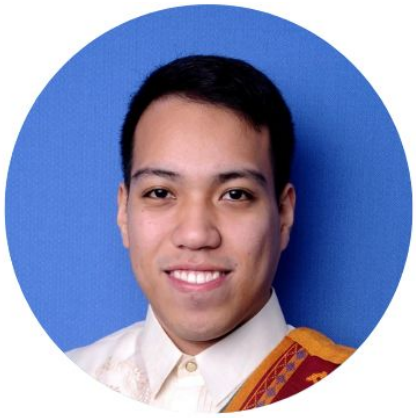
Dr. Hiroe Hara-Yamamura began her career as an environmental consultant at Idea Consultants, Inc. Since June 2023, she has been an associate professor at the Division of Geosciences and Civil engineering at KU. Dr. Hara's research focuses on water quality monitoring and improvement, developing AI-assisted tools and cost-effective methods for contaminant removal. In academic roles, she has served as Secretary of the Subcommittee on IoT, ICT, and AI Utilization in Water and Sewerage Systems since 2022, and Chief Secretary of the PFAS Treatment Technology Research Committee since 2024. In Kanazawa City, she has been a member of the Irrigation Water Conservation Council since 2022 and the Drinking Water Source Conservation Council since 2022 and the Drinking Water Source Conservation Council since 2023. Dr. Hara received the Lane Memorial Award from Hokkaido University, and the Kurita Award at the Japan Society on Water Environment, for her outstanding research and academic performance.

Plenary Speaker

Julius Marvin V. Flores, PhD

Dr. Julius Marvin Flores is a civil engineer and researcher specializing in pavement engineering. He began his career at SM Engineering, Design, and Development, as a project engineer, contributing to the expansion and renovation of SM Supermalls. He also served as a Research and Development Manager in IRIS Technology, where he advanced non-destructive pavement testing and pavement management systems. He is a Balik Scientist awardee under DOST-PCIEERD. Currently, he serves as the Senior Manager of Moojin, a research and development company in South Korea focusing on pavement evaluation. His current work involves developing low-cost pavement evaluation technologies using drones, GoPros, and accessible cameras. Additionally, he founded PAVEx, a Manila-based consultancy and services company specializing in pavement design, analysis, and evaluation.

Karl Ezra S. Pilario, PhD



Dr. Karl Ezra S. Pilario is an Associate Professor at the Department of Chemical Engineering at the University of the Philippines Diliman, and an affiliate of the Artificial Intelligence Program, Energy Engineering Program, and Environmental Engineering Programs at the College of Engineering. He is now a Visiting Professor at the National University of Singapore, working in the area of machine learning-driven process control. At UPD, he currently heads the Process Systems Engineering Laboratory (PSEL), specializing in industrial process data analytics and machine learning applications in energy, water, and environmental process systems. He is also currently an Editorial Board member at the Process Integration and Optimization for Sustainability journal. Dr. Pilario received the rank of University Scientist 1 by the UP System in 2024 for his scientific productivity and academic reputation.

Tonni Agustiono Kurniawan, PhD

Dr Tonni Kurniawan is a recognized global leader in tackling complex environmental problems that have significant societal relevance and positive impact in the world. His research interests are in the areas of digitalization in water treatment, and waste management. His focus on sustained research is evident from over 291 articles in refereed journals, 25 conference proceedings, twelve monographs, and 30 book chapters with an h-index of 64 and citations of over 16,600 counts (Scopus). He received the 2010 Green Talent Award from German Federal Ministry of Education and Research (BMBF), the 2013 Young Scientist Award from the World Economy Forum (WEF) (Switzerland), and the 2014 Scope-Zhongyu (France) for his outstanding research contribution. Since 2020, the Elsevier publisher and Stanford University (US) has listed him among the top 2% of highly cited scientists in the field of Environmental Sciences.

Clodualdo Aranas Jr., PhD, PEng

Dr. Clodualdo Aranas Jr. is an Associate Professor in the Department of Mechanical Engineering at the University of New Brunswick (UNB) in Canada. He is currently a DOST Balik Scientist and Visiting Professor in the Department of Mining, Metallurgical, and Materials Engineering at UP Diliman. Currently, he directs the operations of UNB's Alloy Design Research Laboratory and Ballistics and Mechanical Test Laboratory. His research expertise lies in formative and additive manufacturing technologies metallic materials. He has published more than 150 peer-reviewed research articles in physical and mechanical metallurgy. Dr. Aranas' expertise has been acknowledged through his involvement in major federal projects in Canada, and he is actively engaged in initiatives supporting net-zero emissions strategies through the development of new alloys.

Rex Aurelius C. Robielos, PhD

Dr. Rex Aurelius Robielos is currently a Senior Manager of the Project Management Office, Business Intelligence, and Analytics at Analog Devices General Trias (ADGT). He also served as the Dean of the School of Industrial Engineering and Engineering Management at Mapua University. Dr. Robielos serves as the Vice President of Operations Research Society of the Philippines and Director of Human Factors and Ergonomics Society of the Philippines.

Albert Causo, PhD

Dr. Albert Causo is Balik-Scientist Program Awardee attached to DOST-MIRDC. He is the CEO & Co-founder of Hand Plus Robotics, a robotics company based in Singapore and Malaysia, and also a Co-Founder and Program Director of ALGOrhythm Robotics Center, a robotics education company based in Cebu. He is a former Senior Research Fellow at the Robotics Research Centre at Nanyang Technological University (Singapore). He has developed robotics solutions and conducted R&D with applications in manufacturing, logistics and e-commerce, assistive rehabilitation, and robot-assisted education. His research interests include robot vision, AI/ML for computer vision, robot-assisted education, and the application of unstructured picking robots in various industries.

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Abstracts of Oral Presentations

PS1-1

A Comparative Analysis of Bamboo-derived Wood and Recycled Plastic Composite in Marilog, Davao City

Lance K. Soriano[1*], Piolo John A. Mangulabnan[1], Sofia Loreen B. Popatco[1] and Niño Louie R. Boloron[1,2*]

[1] Mapua Malayan Colleges Mindanao, Davao City, Philippines
[2] Central Mindanao University, Musuan, Maramag, Bukidnon, Philippines
[*]Corresponding author: louieboloron@gmail.com

Keywords: Wood plastic composite, bamboo fibers, waste reduction, plastic recycling, alternative wood product

Wood plastic composites (WPCs) have garnered significant attention as environmentally friendly alternatives to traditional timber products. This study explored the use of bamboo as a reinforcing material in WPCs, offering a sustainable and renewable solution to meet the growing demand for eco-conscious materials. Bamboo, with its high strength-to-weight ratio, rapid growth rate, and renewability, possesses advantageous properties that make it ideal for WPC production. Incorporating bamboo fibers into the composite matrix notably its mechanical strength, stiffness, and dimensional stability, expanding its applications across various industries. The manufacturing process involved combining bamboo fibers from culms with a thermoplastic polymer, such as polyethylene, from plastic wastes alongside additives for improved processing and performance. The resulting composites showcased superior properties; in bending and compression tests, the bamboo-reinforced WPC performed 54% and 15% better than a pure-plastic material, respectively, indicating improved tensile strength and flexural modulus. The use of bamboo in WPCs offers several environmental benefits, reducing dependence on traditional wood resources and supporting sustainable forestry practices. These bamboo-reinforced WPCs have diverse applications in the construction, automotive, packaging, and consumer goods sectors, thanks to their exceptional strength and durability. Additionally, incorporating plastic waste in bamboo-reinforced WPCs contributes to waste reduction and environmental preservation, helping reduce carbon footprints by reusing materials. As research and technology continue to advance, the prospects for bamboo-reinforced WPCs revolutionizing the materials landscape appear promising with future studies focusing on optimizing composite durability, cost-effectiveness, and scalability for widespread use.

PS1-2

Process optimization of flax fiber composite production for indoor and outdoor applications

Rhea Alyssa B. Delicano[1], Diana Marie R. De Silva[1*], Gabriel John L. de Leon[1], Aidrean P. Opaco[2] and Maria Morissa D. Lu[2]

[1] Dept. of Industrial Engineering, University of the Philippines Los Baños, Laguna, Philippines
[2] Dept. of Engineering Science, University of the Philippines Los Baños, Laguna, Philippines
*Corresponding author: drdesilva1@up.edu.ph

Keywords: process optimization, design of experiment, natural fiber composite, flax fiber

Flax fiber composites are natural fiber composites (NFCs) made with reinforcing fibers from renewable sources, which make them environment-friendly. This study determined using Design of Experiments (DOE) the set of parameters for processing flax fiber composites that optimize their mechanical properties in indoor and outdoor applications. The data analyzed using Taguchi orthogonal arrays are derived from Lu and Van Vuure (2019, 2020) to evaluate further the effect of the type matrix and the preconditioning process of flax fibers at various relative humidity (RH) levels on the composite's strength and modulus. The research has concluded that an epoxy matrix and flax fiber conditioned at 80% RH is recommended for outdoor applications. While for indoor applications, the polyester matrix and flax fiber conditioned at 80% RH will yield maximum strength and modulus.

PS1-3

Experimental study on the relationship between concrete cover thickness and surface quality

Yukine YAGI[1*], Tomohisa KAMADA[1], and Atsushi UENO[1]

[1] Department of Civil and Environmental Engineering, Faculty of Urban Environmental Science, Tokyo Metropolitan University, 1-1 Minami-osawa, Hachioji-shi,
Tokyo 192-0397, Japan
*Corresponding author: yagi-yukine@ed.tmu.ac.jp

Keywords: Concrete cover thickness, Surface quality, Cover concrete, Maintenance management

In Japan, there are a number of existing structures with insufficient concrete cover thickness, which increases their risk of cracking, delamination, and spalling due to rebar corrosion. It is known that the quality of the concrete cover may deteriorate due to insufficient thickness. Therefore, the present research focuses on the relationship between the concrete cover thickness and corresponding surface quality. Air permeability tests (Torrent method) and pore structure analysis (Mercury intrusion porosimetry) were conducted using reinforced concrete with different concrete cover thickness and plain concrete specimen to investigate the influence of the concrete cover thickness on its mass transport property and change in pore structure in depth direction. Based on the results, it was confirmed that the thinner the concrete cover, the higher the air permeability at the surface layer. This tendency was more significant when the cover thickness was less than 20 mm (maximum size of coarse aggregate). Meanwhile, both total pore volume and threshold pore diameter became coarser within 10 mm of the rebar vicinity, regardless of the concrete cover thickness. On the other hand, the unreinforced specimens were found to have a uniform pore structure over its entire depth, indicating that the presence of rebar affects the pore structure within the rebar's vicinity. The preceding observations indicate that the thinner the concrete cover, the larger the proportion of low-quality regions (rebar vicinity) in the whole cover concrete, thus, establishing the relationship between the concrete cover thickness and surface permeability.

PS1-4

Correlation Assessment of Strength of Concrete and Reinforcing Bars, and Type of Concrete Mix Method in Structural Construction Material Cost for a Simple 3D Concrete Frame subjected to Code-based Loadings and Design

Neil Abuel A. Morada[1,2*]

[1] Batangas State University – The National Engineering University, Batangas City, Philippines
[2] Office of the Provincial Engineer, Province of Batangas, Philippines
*Corresponding author: abuelmorada@gmail.com

Keywords: Cost correlation; concrete grade selection; rebar grade selection; structural material cost; estimation

With the availability of different concrete and reinforcing bar strengths in the Philippines, the design might not be optimized in terms of cost due to the lack of basis in the selection of material strengths. Value engineering can be used to address this, however, the repetitive conduct of structural analysis to come up with the optimized design would entail time-consuming efforts for the structural designers. In this study, the researcher utilized the concept of regression to determine the significance of each material strength, and type of concrete mix in the structural material costs. This also features a way to determine the optimized setting which would most likely produce the minimized cost of materials. Three levels of concrete strength (21, 24, 28 MPa), three levels of rebar strength (228, 275, 414 MPa), and two levels of type of concrete mix (SMC, RMC) were utilized in the structural design of a simple 3D concrete frame using MIDAS Gen ensuring the adequacy and compliance to SCP 2015. These factors and the material cost responses were analyzed using Minitab. It was found out that all factors used in the regression analysis are considered significant to the total material cost response. The optimized setting consisting of 24 MPa concrete, 414 MPa rebar, and site-mixed concrete, produces the minimized material cost for the given structure. The steel-to-concrete ratio of 131.00 for slabs, 86.25 for beams, 112.93 for columns, and 158.64 for foundation based on the optimized setting was determine which can serve as the target steel-to-concrete ratio to ensure optimized material cost.

PS1-5

Compressive Strength and Binder Intensity Prediction in Concrete Mixes using a Customised Neural Network with Explainability

Aswini Kumar Patra[1*] , Yamem Tamut[2] , and Sudisht Mishra[3*]

[1] Department of Computer Science and Engineering, NERIST, Nirjuli, India.
[2, 3] Department of Civil Engineering, NERIST, Nirjuli, India.
*Corresponding author: aswinipatra@gmail.com/ sudisht_mishra@nerist.ac.in

Keywords: Neural Network, Explainable Machine Learning, Compressive Strength, Binder Intensity, Concrete Mix Design

Concrete is an essential construction material due to its balanced plasticity properties, mechanical strength, and cost-effectiveness. Traditionally, concrete mix design relies on empirical formulas and trial tests to determine suitable mix proportions. The process, however, is both time-intensive and complex, primarily due to the variability in raw materials' physical and chemical characteristics and the intricate ways they interact. Advanced methods are necessary to integrate various input parameters and achieve the desired outcomes efficiently. This study addresses these challenges by proposing a customized neural network with fine-tuned parameters, an appropriate optimizer, a learning rate schedule, and a regularization technique to predict compressive strength and binder intensity in concrete mixes. The model leverages sixteen input variables, including water and cement content, fly ash content, mineral activity index, sand and coarse aggregate properties, and water-to-binder ratio. While neural networks are powerful tools capable of capturing complex, non-linear relationships in data, their "black box" nature often limits their utility in applications requiring transparency. To tackle this issue, we integrate Shapley additive explanations (SHAP) into the proposed framework. SHAP enables a deeper understanding of the model by highlighting the importance of each input feature, making the predictions more transparent and easier to interpret. This enhanced interpretability supports decision-making by showing how different inputs contribute to the target variables. Our approach outperforms various regression-based machine learning models, achieving superior results with k-fold cross-validation. The proposed model delivers exceptional performance with coefficient of determination (R2) values of 0.982 and 0.950 for predicting compressive strength and binder intensity, respectively. These results demonstrate the model's effectiveness in capturing the complex interactions between the input variables and the target properties. By combining predictive power with explainability, our study establishes a new benchmark for concrete mix design and provides a transparent and practical approach for optimizing mix proportions. This work highlights the value of merging machine learning with interpretability tools in material science, paving the way for more effective, reliable, and innovative solutions in construction engineering.

PS1-6

Sustainable Cooling Solutions: Evaluation of Honeycomb-Structured PVC Pipe-Based Air-Cooling System

Kent Patrick Ferraro[1*], Ma. Kathleen Duran[1], Bryan De Guzman[1], and Jacob Sabido[1]

[1] National University, Manila, Philippines
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Keywords: Air Cooler, Evaporative Cooling, Honeycomb Air Cooling System, PVC Pipes

This study investigates the development and assessment of an innovative air-cooling system using honeycomb-structured PVC pipes, focusing on environmental sustainability and energy efficiency. The system leverages evaporative cooling by circulating water through PVC pipes to lower air temperatures. Experimental tests using 2-inch, 3-inch, and 4-inch PVC pipes showed that the 4-inch pipes achieved the highest cooling efficiency, reducing room temperature by 4.28%, followed by 3-inch pipes at 3.87% and 2-inch pipes at 3.07%. Statistical analyses, including ANOVA and t-tests, confirmed the significant impact of pipe diameter on cooling performance. The system's consistent results demonstrate its potential as a sustainable alternative to conventional air conditioning. Beyond cooling, it promotes resource conservation by reusing water and repurposing PVC materials, aligning with circular economy principles. A life-cycle analysis indicated a notable reduction in carbon footprint compared to traditional cooling technologies, reinforcing its environmental advantages. This research contributes to the development of cost-effective, eco-friendly cooling solutions, offering insights into optimizing air cooling systems and promoting sustainable innovations in engineering applications to address climate change and global temperature increases.

PS1-7

Fuel Consumption among Public Utility Jeepney in Laguna, Philippines

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Keywords: automotive technology; engine tune-up, fuel consumption; jeepney drivers; transportation operators

Public transportation particularly jeepney plays a crucial role in daily life of every individual. Likewise, jeepney drivers and operators face challenges on routes including high fuel costs, engine maintenance, repairs, traffic violations, and accident risks.This study examines the factors affecting engine tune-up and fuel consumption among public utility jeepney drivers and operators. It concentrates on engine type, driving speed, engine age, fuel refilling time, and route frequency. This study employed a descriptive research method and utilized random sampling, with a total of 279 respondents, who provided data through a validated survey questionnaire. The gathered data were analyzed using descriptive statistics and regression analyses through the Statistical Package for the Social Sciences (SPSS). The findings reveal that the most common engine type was 4BC2 reflecting its prevalence in jeepney operations. Regarding speed, the majority of drivers operated between 41–60 km/h (68.1%), highlighting the typical urban and semi-urban route conditions. Simultaneously, analysis of engine age showed that 41.58% of the vehicles were 13–20 years old, underscoring the challenges of maintaining older engines in terms of fuel consumption and performance. Fuel refilling was predominantly done in the morning while the frequency of plying routes ranged from one to six times daily. Meanwhile, regression analysis revealed significant effects between engine age and speed with fuel consumption while engine type showed no significant effect. The results underscore the importance of regular engine maintenance and efficient driving practices to optimize fuel consumption and reduce operational costs. Supporting literature highlights that aging engines and inconsistent driving speeds significantly impact fuel consumption, efficiency and vehicle performance. It also contributes to the limited literature on public utility vehicle management in developing countries, providing actionable insights for operators, policymakers, and stakeholders.

PS1-8

Using Systems Simulation in Assessing the Impact of Road Widening on the Level of Service and Travel Time at the University of the Philippines Los Baños

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Keywords: traffic simulation modeling; road widening; vehicle capacity ratio; campus transportation planning

Road widening is a common solution to increase road capacity and address traffic congestion. However, it comes with substantial costs and changes the landscape permanently, so it is essential to conduct a thorough analysis of its impacts. This systems simulation study examines the possible effects of Phase 1 of a PhP 26.5-million road widening project at the University of the Philippines Los Baños (UPLB). This project intends to reduce congestion, particularly during peak hours, by changing two lanes of the road configuration into a four-lane scenario. By developing simulation models based on empirical data from the key entry and exit points with FlexSim software, simulations of current two-lane and proposed four-lane configurations were analyzed and compared for Volume-Capacity Ratio (VCR), time of travel, and economic impact. Results indicate significant improvements in traffic service levels, corresponding decreases in VCR values, and vehicle stay times. Additionally, the study computes an annual saving of PhP 4.09 million in opportunity costs, thus providing further proof of the project's economic feasibility. These results give basis to evidence-based insights and aid university traffic planners through the UPLB Transport and Traffic Management Committee (TTMC) in evaluating the potential impact of the road widening project on campus traffic conditions and inform future decision-making.

PS1-9

Development of an Adaptive Vibration Monitoring System for Automotive Applications

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Keywords: Adaptive Vibration; Automotive Applications; Noise Cancellation; Sigma Delta Modulation

This study proposes an adaptive vibration monitoring system designed to address challenges in automotive applications, such as high-frequency noise, harmonic distortion, and the need for real-time data analysis. The system employs a Sigma-Delta Modulator (SDM) for high-resolution signal conversion and integrates an adaptive noise cancellation algorithm to effectively mitigate interference. A comprehensive methodology, including system design, simulation, and performance evaluation, is presented to demonstrate the system's feasibility. Key findings indicate that the system achieved an 85% reduction in interference, effectively suppressing high-frequency noise while maintaining high-resolution analog-to-digital conversion. The SDM's oversampling capability enhanced signal accuracy, while the adaptive algorithm isolated fundamental vibration frequencies despite a Total Harmonic Distortion (THD) of 181.475%. Fourier analysis of the vibration signals highlighted the system's ability to identify key vibration patterns, validating its potential for early fault detection and predictive maintenance. Although the high THD underscores the need for further optimization, the results demonstrate the system's promise in improving vibration monitoring accuracy. Future research will focus on refining the algorithm and filter design to minimize harmonic distortion and enhance performance. Real-time implementation and field testing are planned to validate the system under actual automotive conditions. Additionally, hardware optimization will be explored to facilitate seamless integration into cost-effective, energy-efficient automotive safety systems. The proposed system represents a significant step toward enhancing vehicle safety, durability, and operational efficiency through advanced vibration monitoring technologies.

PS1-10

A comparative life cycle assessment of public bus technology alternatives: Case study of Auckland, New Zealand

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Keywords: Life Cycle Assessment, Environmental Impacts, GHG Emissions, Battery Electric Bus, Hydrogen Fuel Cell Bus

In Auckland, New Zealand (NZ), transportation is the most significant contributor to greenhouse gas (GHG) emissions, representing 43.6% of the region's GHG emissions. The NZ government has mandated zero-emission public transport buses by 2025, aiming for a fully decarbonised bus fleet by 2035. This study analyses the environmental implications of integrating battery electric buses (BEB) and hydrogen fuel cell buses (HFCB) into Auckland's public bus system using the life cycle assessment (LCA) method. The study assessed the environmental impacts of the complete life cycle, encompassing all stages from raw material extraction to disposal, of the three bus technologies currently in use in Auckland, including Internal Combustion Engine Bus (ICEB), BEB, and HFCB. The LCA evaluated global warming potential (GWP), human toxicity potential (HTP), mineral resources scarcity (MRS), and fossil resources scarcity (FRS). The results showed that BEB and HFCB demonstrate substantial reductions in GWP and FRS of up to 84% compared to diesel buses. However, BEB and HFCB also exhibit higher levels of HTP and MRS potential. The operational phase is the primary source of environmental impacts for HFCB and ICEB, whereas, for BEB, battery pack production is the dominant contributor to their overall environmental footprint. Sensitivity analysis shows that BEB and HFCB impacts are highly influenced by bus lifespan and battery replacement frequency. Furthermore, scenario analysis indicates that a 100% renewable grid could further reduce BEB impacts and cut the Auckland bus fleet's life cycle GHG emissions by up to 76%.

PS1-11

Reinforcing Earthquake Response: Equitable Disaster Relief Shelter Distribution Through Intermodal Transportation

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Keywords: intermodal transportation; equity; route reliability; vulnerability; earthquake response

In the aftermath of sudden onset disasters like earthquakes, humanitarian agencies are challenged to facilitate timely and equitable relief shelter distribution to affected communities, especially when compounded with disrupted networks and heightened population vulnerabilities. Intermodal transportation offers a flexible combination of air, sea, and land transport to overcome logistical barriers and widen geographical coverage. Hence, a cost-minimizing mixed-integer linear programming (MILP) optimization model of the relief shelter distribution through intermodal transportation was developed, from which a user interface was also made. The model integrated two fairness constraints: selecting reliable routes and ensuring equity for priority and non-priority areas. It determines the optimal transportation cost in a three-echelon humanitarian supply chain along with the modes of transport utilized, routes taken, and the number of relief shelters distributed to the affected areas. The country-wide relief operations in the 2019 magnitude 6.9 earthquake in Matanao, Davao del Sur were utilized to test the model's effectiveness. In adherence to the standard relief time (SRT) of 12 hours, 44.02% of households were expected to receive relief shelters. This was made possible through the 66.67% utilization of intermodal transportation, surpassing all infrastructure constraints. The key findings of this study were triangulated by assessing its robustness through a scenario analysis centered on the triple bottom line and humanitarian expert opinions. Furthermore, this study provides a reliable and robust decision support tool for humanitarian agencies when subjected to large-scale disasters where increasing vulnerabilities of affected communities and surging damages on road infrastructures are inevitable.

PS1-12

Developing an Excel-Based Route Planning System for Agricultural Products Pickup and Delivery in Benguet, Philippines

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Keywords: Agricultural Supply Chains; Excel Visual Basic Advance; Floyd-Warshall Algorithm; Transportation; Route

Agricultural development is a potent tool to combat extreme poverty, boost shared prosperity, and provide for the projected 9.7 billion people by 2050. Minimizing food waste often involves improving practices at various stages of the ASC, such as better storage methods, more efficient transportation, and optimized distribution systems. The main study area is Benguet, known as the “Salad Bowl of the Philippines” because of its high production of upland vegetables. This study hopes to provide a more robust and efficient transportation of the produce through a route guidance system that provides trip chaining opportunities in the study area using Excel and Excel Visual Basic Advance (VBA) with no internet connection after initialization. Based on the EMME software’s baseline model and trial run of the program, the study has proven that Excel VBA can be utilized to provide a skeletal route guidance system for the primary stakeholders of the study area.

PS1-13

Examining Vehicular Accident Pattern Along National Highway 66 in Alappuzha District, Kerala, India

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Keywords: Vehicular Accident on Roads; Road traffic accident; Fatality; Hit Pedestrian; MTW

This study investigates the numerous factors influencing the Vehicular Accident on Roads (VAR) along the National Highway 66 (NH66) passing through Alappuzha district, Kerala, India. A total of 1256 VAR data were collected from different police station of the district. The total number of victims were 1690 resulting victim to accident ratio (VTAR) as 1.346. More than one vehicle involved accidents were 64.33%. Fatal, grievous, minor and no injury type accidents were 176(14.01%), 873(69.51%), 192(15.29%) and 15(1.19%), respectively, whereas number of victims were 191(11.30%), 990(58.58%) and 509(30.12%), respectively. Data showed that MTW and Pedestrians are the most victim of VAR. The maximum number of fatalities were due to 'Hit Pedestrian' (33%). Maximum number of fatalities occurred within the age groups of 18-30 years (25.13%), and maximum fatalities happened during 19-20 hr. (13.09%). This study and data may be useful to develop a statistical or machine learning model for further investigation and implementation of remedial measures to minimize VAR.

PS2-1

Assessment of Food-Grade Metal Safety in Agricultural Machinery: Residual Contamination in Processed Agricultural Commodities

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Keywords: agricultural machinery, food safety, metal residue.

Stainless steel, particularly grades such as AISI 304SS and 316SS, is extensively used in food processing due to its excellent corrosion resistance, durability, and ease of cleaning, which are essential for maintaining food safety and hygiene standards. However, the verification of food-grade materials has rarely been evaluated. This study investigates the potential transfer of metal residues from food-grade machines to processed agricultural products (coffee, calamansi juice, coco sugar, and turmeric powder). An X-ray Fluorescence (XRF) analyzer was used to determine the metal composition of the processing equipment. Levels of iron (Atomic Absorption Spectrophotometry (AAS) and lead (Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) in the processed products were determined. The results showed minimal presence of impurities. Levels of iron and lead in the final products remained below international safety standards, suggesting minimal contribution of processing equipment to metal residue content. Based on these findings, a comprehensive evaluation framework is proposed for food equipment manufacturers and users. This framework emphasizes adherence to international safety standards, application of HACCP principles, equipment maintenance, and operator training. This comprehensive approach aims to ensure machinery compliance with safety regulations and overall food processing integrity, ultimately promoting consumer health protection.

PS2-2

Design and Development of a Trailed-type Dynamometer for Tractor Drawbar Force Measurement

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Keywords: load cell, dynamometer, drawbar power

The primary purpose of agricultural tractors, especially those in the middle to high power ranges, is to perform drawbar work. Several instrumentation systems for tractor performance testing such as; drawbar power, PTO-power, fuel consumption and other tractive parameters have been developed by researchers and engineers in many countries. AMTEC, the Philippine official testing center, lacks the needed instrumentation systems mainly due to their high investment cost. For this reason, there is a need to develop an instrumentation system for tractor performance measurement especially drawbar power. Drawbar work is defined by draft (horizontal component of pull) and travel speed. The general objective of the study is to develop a trailed-type draft measuring system for agricultural tractors. The tractor performance parameters such as draft force (horizontal component of pull), wheel speed and fuel consumption were determined using the standard methods of test for tractors (PAES 119:2001). The test tractor was made to pull the trailed-type dynamometer on a level concrete test track. The dynamometer works on the principle of hydraulic pumping system using the rear pneumatic tires to drive a fixed displacement in-line pump. The load is varied by restricting the pump discharge by means of an adjustable flow control valve as the tractor moves forward. A 5-ton capacity S-type load cell was used to measure the draft mounted between the test tractor and the trailer. The speed of travel was determined using a tachometer installed at the fifth wheel attached to the trailer body. Experimental tests showed that the average drawbar power of the test tractor was 21.42 kW, 26.97 kW and 29.20 kW for the 1st, 2nd and 3rd gear setting respectively, was produced using a 50-hp Landini Minstral tractor.

PS2-3

Physiological Responses of Farm Tractor Operators During Ronnie Baugh Tractor (Oggun II) Operation at Different Speeds and Terrains

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Keywords: muscle activity; vibration; speed; terrain; Ronnie Baugh Tractor

As an agricultural nation, the Philippines requires modern machinery to help farmers improve productivity while minimizing costs. The Ronnie Baugh Tractor (RBT) offers an alternative to traditional 4-wheel tractors; however, it exposes operators to potential risks related to vibration exposure and muscle activation. Given its recent adoption in the country, safety evaluations are necessary to ensure the well-being of the operator. This study establishes baseline values for vibration and physiological responses during dynamic RBT operation. Six experienced tractor operators participated and performed five common tractor-driving tasks in varying conditions (two speeds and two terrains). Muscle activities and vibrations were measured and recorded, while subjective comfort and discomfort ratings were assessed. Results showed that vibrations increased with speed and rough terrain. Values exceeded their respective safety limits, with predicted comfort reactions of very to extremely uncomfortable. This is due to the lack of a suspension system for the engine. Muscle activation in the forearm, upper arm, and front shoulder showed extremely weak to light exertion, while the leg muscle exhibited moderate to strong muscle activation in several conditions. However, upper limb muscle activation increased with fast speed and rough terrain, while leg activation was higher at slow speed on rough terrain. Subjective ratings were not significantly different. Long durations of low-level muscle activation combined with exposure to high levels of vibrations can lead to musculoskeletal injuries. Overall, changes in speed and terrain were found to affect muscle reactions and vibration levels, impacting operator safety and performance.

PS2-4

Designing a Decision-Support System Architecture for Career Selection: A Case Study at the University of the Philippines

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Keywords: Career selection; SCCT; DSS; User interface prototype; System architecture

The decision-making process for career selection is a complex phenomenon for students who are going through their transition from high school to higher education. In this paper, a decision-support system (DSS) architecture was designed to help address the aforementioned problem. Using instrumental case study research method, the study investigated the decision-making process of incoming college students in their career selection and identified user requirements essential to the development of the decision-support system by following a four-phase Waterfall methodology for systems development. The study was anchored on social cognitive career theory (SCCT), which served as the basis for the inclusion of decision-making factors. The University of the Philippines (UP) was chosen as the case site for being the national state university of the country and having its own streamlined, process-centered admission system, the UPCAT. Factors derived from SCCT were further validated from interview responses of UPCAT 2024 applicants who recently undergone this decision-making process in their career selection. Responses from the interview were transcribed and imported to NVivo software for coding and theme segmentation. These themes were then organized into business, functional, nonfunctional, and system requirements. The requirements were transformed to requirements modeling, through use case diagramming, and data modeling, through entity relationship diagramming. A user interface (UI) prototype of the career selection DSS, named as UP College Admission Decision-making Tool (UP-CADET), was the final output designed using Figma. Finally, results from 23 potential users of the user acceptance test, using a 7-point Likert scale, indicated positive views for UP-CADET.

PS2-5

Experimental investigation on the drying performance and environmental assessment of a 3-tiered single slope solar greenhouse dryer

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Keywords: Career selection; SCCT; DSS; User interface prototype; System architecture

A solar greenhouse dryer is a sustainable and innovative solution for drying agricultural products, as it utilizes solar energy in a controlled greenhouse environment. The drying efficacy is improved and post-harvest losses are reduced by integrating greenhouse technology and solar drying principles. The system captures and retains solar radiation, converting it into heat, accelerating the drying process, and enhancing the internal temperature. This study investigates a solar greenhouse drier (GHD) with a single-slope design, which offers economic and environmental advantages, to dry green chilies (*Capsicum annuum*), neem leaves (*Azadirachta indica*), and curry leaves (Murraya koenigii) in natural convection mode in the climatic conditions of North East India. The results indicated that the moisture content of green chillies, neem leaves, and curry leaves decreased by 0.20 dry basis (d.b.), 0.15 (d.b.), and 0.12 (d.b) respectively, compared to their initial values of 5.66 (d.b.), 4.26 (d.b.) and 4.12 (d.b). The products inside the GHDdried between 7.5 - 12 hours, significantly faster than open sun drying (OSD) which took 10 - 18 hours to dry the same. The drying efficacy of the GHD was between 28.55% and 34.50%. The energy efficiency of the upper section ranged from 45.5% to 95.3%, while the lower section was between 27.7% and 81.2%. Similarly, the energy utilization ratio experienced substantial fluctuations, ranging from 10% to 85.3%. Environmental parameters were also considered where energy payback time, CO2 mitigation, and CO2 emissions associated with the production of the GHD were calculated.

PS2-6

Computer Vision-Based Classification of Waxed and Unwaxed Satsuma Mandarins

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Keywords: computer vision; image processing; non-destructive testing; satsuma mandarins; wax coverage detection

The application of wax coatings on citrus fruits, such as Satsuma mandarins, is a common practice aimed at enhancing their appearance and extending shelf life. However, there is currently a limited tool for assessing the coverage of wax on these fruits. This study investigates a computer vision approach for detecting wax coverage on Satsuma mandarins. The research involved using threshold values of 75, 100, 125, 150, 175, 200, and 225 to determine the white pixel count in images of the citrus fruits. The optimal threshold values were validated using confusion metrics. The results indicated significant differences in white pixel counts between the various threshold values and between the waxed and unwaxed conditions, with p -values of 0.0001 and 0.0036, respectively, based on a two-way analysis of variance at a 95% level of significance. The findings revealed that the optimal threshold values for detecting wax coverage on citrus were 100 and 125, based on visual inspection of the images. Performance metrics at these threshold values achieved high validation results for accuracy, precision , sensitivity, and F1 score, with scores of 0.78, 0.85, 0.75, and 0.79, respectively. This suggests that a threshold value of 100 is reliable for assessing wax coverage on Satsuma mandarins.

PS2-7

Human-Centered Graphical User Interface and System Design of a Mobile Application on Digitizing Farm-to-Table Operations

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Keywords: agricultural technology, digital agriculture, digitized trading system, food miles, intelligent systems

Mobile applications (apps) used in agriculture have assisted farmers in making decisions, utilizing embedded technologies such as artificial intelligence applied in farming and improving accessibility to the market. These benefits can only be harnessed once the users have effectively utilized the mobile app; however, the complexity of the graphical user interface, complicated system design, and irrelevant functions and features prevent users from doing so. This study created a graphical user interface (GUI) and system design using the Human-Centric Design (HCD) approach for a mobile app covering farm-to-table operations. The system is designed based on the users' needs and preferences to maximize the use of Artificial Intelligence (AI) to assist agricultural stakeholders during trading. The difference in this study lies in understanding the critical needs of users first before designing. A structured interview using the survey questionnaires was conducted with the farmers, disposers, and drivers. Insights and information were gathered to develop the digitized system, GUI, and diagrams, which were evaluated through a 5-point Likert scale survey. The overall result of the evaluation shows that the stakeholders agree with the survey statements, with 4 as the median and 0.89 as the standard deviation. This implies that considering the users first before designing a mobile app is crucial to achieving a higher user acceptance rate. By tailoring the features and functions based on requirements, users could maximize the use of this technology, resulting in higher productivity and profit.

PS2-8

Small-Scale Evaporative Cooler Utilizing Dried Corn Cobs as Cooling Pad Extends Shelf Life of 'Mucho' Eggplants (*Solanum melongena* L.)

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Keywords: evaporative cooling; agro-wastes; corn cobs; eggplant; shelf life

Alternatives to expensive refrigeration systems are essential for reducing postharvest losses in perishable produce, especially for small-scale stakeholders. Evaporative cooling (EC) is a low-cost, effective solution that leverages cooling pads to lower the temperature and increase relative humidity (RH) surrounding the stored fresh produce. This study evaluated a laboratory-scale evaporative cooling (EC) system using dried corn cobs as a cooling pad to prolong the shelf life and preserve the postharvest quality of 'Mucho' eggplants (*Solanum melongena* L.). The EC chamber, constructed from a 155-L insulated plastic container with a fan, water supply system, and 6.67-cm thick corn cob cooling pad effectively lowered the temperature by 0.92°C and increased RH by 10.09%, achieving an average saturation efficiency of 46.88%. Good quality, uniform-sized eggplants without visible bruises were sorted and equally divided between ambient storage (28.87°C ± 1.33, 85.96% ± 3.60) and the EC chamber (27.95°C ± 1.16, 96.05% ± 2.76). Daily monitoring of visual quality rating (VQR), shriveling, weight loss, and firmness revealed that EC-stored eggplants experienced significantly slower rate of deterioration and retained higher firmness compared to those held in ambient conditions. The EC system extended eggplant shelf life to 8 days compared to 5 days for ambient-stored storage. These findings highlight the potential of dried corn cobs as a cost-effective cooling pad material, providing an affordable and sustainable solution to postharvest storage challenges.

PS2-9

Experimental Dynamic Analysis of a Rotating Flexible Kink Robotic Link

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Keywords: Structural Dynamics, Tip deflection, Kink robotic link, Flexible manipulator, Partial differential equation

Both numerical and experimental analysis of the dynamic response of a rotating kink cantilever beam are presented in this work. An experimental set-up has been prepared to determine the natural frequency and mode shape by varying the kink angle. The results showed that the dynamic response of a rotating kink cantilever beam is significantly impacted by the kink angle. Natural frequency and mode shape vibration responses obtained by altering the kink angle are compared and validated with those obtained by finite element modelling. The percentage errors are found within the permissible limits.

PS2-10

Post-Harvest Technology Management System of Selected Fruits for Export

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Keywords: Technology Management, Carabao-Mango, Best Practices

Business of exporting Philippine fresh fruits is beset with problems: non-compliance with quality standard imposed by importing countries. Risk of fruits detained at entry port of importing country, resulting in losses for local exporter: spoilage due to long storage period, shipping cost, storage fines, loss of export opportunity. Failure to meet strict phyto-sanitary requirements lead to decline of export of fresh Cavendish banana, Carabao mango recently. The study assessed current post-harvest technology management (TM) practices of stakeholders or exporters within supply chain of Cavendish banana, Carabao mango for export to establish post-harvest TM system.. Best post-harvest operations, TM practices, challenges were investigated to establish factors to implement sustainable post-harvest TM practices. Descriptive, inferential statistics were used, respondents were selected via purposive sampling. Study covered six exporters, data were gathered using survey questionnaires and focus group discussions then treated in SPSS. Stakeholders in post-harvest operations adopt traditional practices with insufficient machineries lacking in good manufacturing practices while best practices considered is adopting sufficient machineries, post-harvest TM tools, standards, GMP, GAP, HACCP. On the readiness of personnel to adopt new technology in sustainable post-harvest for said fruits, the study demonstrates statistically significant outcomes, with correlation coefficient results. Statistically significant relationship indicate acceptance of personnel to adopt new technology in exchange for traditional practices, with Odds Ratio results confirmed. Challenges in implementing the system include cooperation to provide personnel with continuing education, training for productivity combined with work experience. Post-harvest TM framework for each fruit was established on risk, correlation, regression analyses. Accordingly, exporters are in position to adopt post-harvest TM systems: a framework, as established by this study towards operational sustainability. The system incorporates technology-aided orientation program, post-harvest facility sharing, continuous improvement blueprint preparation for Industry 4.0. Finally, study recommends updating strategic post-harvest TM system for export of mentioned fruits.

PS2-11

Rapid Classification of Cohesionless Soils Using Convolutional Neural Networks on Soil Images

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Keywords: Soil Classification; Neural Networks, Artificial Intelligence

The Unified Soil Classification System (USCS) is one of the systems used to categorize soil. The problem with this system is that it is time-consuming and laborious. This study proposed an alternative method wherein image pre-processing techniques and convolutional neural networks (CNN) were used to classify cohesionless soils based on images. The seven cohesionless soil samples were collected from the University of the Philippines Los Baños (UPLB) and verified using laboratory procedures. Images of these identified soil samples were taken from distances of 30 cm, 45 cm, and 60 cm; with angles of 45°, 60°, and 90° from the surface. The raw images were pre-processed by applying image resizing, image rotation, and filter application which yielded 1512 images. Five models were trained from varying image resolutions to determine the optimal image size. The results determined that the model trained from the 512 x 512 pixel-sized images obtained the highest validation accuracy of 86.24 %. Moreover, it was observed that the model was able to differentiate between gravel and sand groups, as well as fine and coarse-grained soils.

PS2-12

Comparative Study Between Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) with Sensitivity Analysis for Suitability Mapping of Constructed Wetlands in Negros Oriental, Philippines

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Keywords: nature-based solution, site selection, multi-criteria decision making, geographic information, sensitivity analysis

Constructed wetlands (CW) are efficient in treating wastewater, but due to large area requirements, implementation of CW is limited. To optimize resources, suitability mapping is conducted to focus on areas with the most optimal environment for the implementation of CW. Numerous studies conducted suitability mapping using Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) but there were only limited studies to suitability mapping of CW. This study, utilizing sensitivity analysis, evaluated the reliability of AHP and ANP models and compared their suitability maps. Results showed both models are reliable, but using Analysis of Variance (ANOVA), AHP is more sensitive, with Distance to Water Bodies (DWB) being significantly sensitive, while all criteria in ANP are equally sensitive. This means that AHP method provided a more accurate interpretation of the effects of criteria weights on the suitability mapping of constructed wetlands. In terms of criteria weights, DWB has higher weight in AHP than ANP, while Distance to Population Center (DPC) has higher weight in ANP than AHP. In terms of suitable locations, AHP has generated more suitable locations than ANP. On the other hand, distinct areas that are considered highly suitable in one method but not to the other were identified. In general, AHP has more distinct areas with 17% of the total land area of the province compared to 14% of ANP, but in selected cities, ANP has more distinct areas than in AHP. Results showed that in Bayawan City, around 4% of the highly suitable lands are distinct in ANP, while only around 3% of the highly suitable lands are distinct in AHP. The results highlight the importance of selecting the most appropriate method based on selected areas. Generally, AHP generated distinct areas in the whole province of Negros Oriental but on a small-scale analysis, ANP generated more distinct areas, such as in Bayawan City and Santa Catalina.

PS2-13

Prepositioning Disaster Relief Supplies in Region V, Philippines Using Two-Stage Stochastic Optimization

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Keywords: Prepositioning; Transportation Problem; Two-Stage Stochastic Optimization; Mixed-Integer Linear Program (MILP); Disaster Risk Reduction and Management

Bicol is one of the high-risk regions for typhoon disasters. Devising and executing a disaster response plan is challenging given the uncertainties of a typhoon trajectory. This study handles the stochastic nature of typhoons by simultaneously considering multiple scenarios in executing a two-stage stochastic linear programming model. The objective function of the model is to minimize total expected cost associated to prepositioning and post positioning of family food packs (FFP) and the non-satisfaction of any demand. The model also includes many practical cost and operational parameters that measure the expected serviceability of the solution. The model is tested under various assumptions, setup, and parameter changes. Results have shown that the stochastic assumption of the model yields higher service levels compared to a deterministic setup the more the actual typhoon trajectory deviates away from its centerline forecast. Moreover, results from the sensitivity analysis have shown that the model reacts objectively to different parameter changes. The design and testing of the user interface for a web-based application of the model further show the viability of the model in becoming a practical policy and decision support tool for strategic and tactical use in Disaster Risk Reduction and Management (DRRM) disaster response planning.

PS2-14

Design and Integration of a UV Sterilizer System Utilizing Spectrophotometry for Algae Detection in Hydroponics

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Keywords: UV sterilizer; spectrophotometer; phototransistor; algal biomass; absorbance

The study developed and implemented a UV sterilizer system, which utilizes an automated spectrophotometer, to monitor and reduce the algal biomass in a sample hydroponics reservoir. The study implemented a triplicate trial setup which lasted 48 hours each. The controlled setup does not have the UV Sterilizer system and was monitored through the standard laboratory spectrophotometer, while the experimental setup had the proposed UV sterilizer system and automated spectrophotometer. By having the two types of setups, the impact of introducing ultraviolet light to the growth of algae was further emphasized. The constructed spectrophotometer used an Arduino UNO, a 660 nm wavelength emitter diode, a phototransistor, and a cuvette. The data showed a negative slope for the absorbance readings of the experimental setup. As for the control setup, an upward slope was observed on the algal biomass density. Different statistical analyses were also performed which further verified the initial findings that the spectrophotometer and UV sterilizer system were functional and yielded positive results.

PS3-1

Model Development in the Assessment of Sludge Accumulation Rate and Desludging Interval of Domestic Septic Tanks in the Philippines

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Keywords: Onsite wastewater treatment; Sludge removal rate; Sensitivity Analysis

The current policy of desludging in the country is every 5 years. However, related studies from other countries suggest a more frequent desludging interval to ensure that solids are not carried over. The study aims to assess the sludge accumulation rate and desludging interval using Pussayanavin's sludge accumulation rate formula, analyze the sensitivity of factors that affect the sludge accumulation rate and desludging interval, and develop a model which easily calculates the sludge accumulation rate and desludging interval in the country. The study was based only on the data gathered from water and environmental agencies in the Philippines. Actual testing and experimentation on sludge were not included. Data calculations and sensitivity analysis were done using Microsoft Excel 2013. Development of a tool was done using Microsoft Visual Studio 2022. As a result, the calculated sludge accumulation rate and desludging interval were 37.18 mg/L per day and 2 years, respectively. Furthermore, the factors that were found to have a significant effect on the desludging interval were TSS, Inflow, Volume, and the number of persons per household.

PS3-2

Optimization of Hydrolysate Production from *Sargassum* spp. for Polyhydroxyalkanoates (PHA) Production

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Keywords: Acid hydrolysis, Fermentation, Macroalgae, Polyhydroxybutyrate

The search for environmentally friendly alternatives to traditional plastics has led to increased interest in biodegradable polyhydroxyalkanoates (PHA). Seaweeds, with their high carbohydrate content and sustainability, have emerged as a promising source of feedstock. This study focused on optimizing the hydrolysis of Sargassum spp. using dilute acid pretreatment and enzymatic hydrolysis to produce PHA. The study employed a factorial design to evaluate the effects of enzyme dosage and incubation time on reducing sugar yield, while a central composite design (CCD) was used to identify the optimal enzyme loading and incubation time. The results show that dilute acid pretreatment followed by enzymatic saccharification can efficiently release reducing sugars from the biomass. The optimal hydrolysis condition achieved was the utilization of 60 FPU cellulase/g biomass for 20.30 hours, resulting in a maximum total reducing sugar yield. Subsequent fermentation using Cupriavidus necator KCTC 2649 yielded a maximum PHA concentration of 7.99 g/L, with all carbon sources being consumed by the microorganism. This suggests that Sargassum spp. has significant potential as a renewable feedstock for PHA production. This study advances research on sustainable bioplastics from renewable resources. It offers insights into optimizing hydrolysis for PHA production from Sargassum spp., with promising applications in the bioplastics industry.

PS3-3

Optimization of Hydrolysate Production from *Caulerpa* spp. for Polyhydroxyalkanoate Production

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Keywords: Acid hydrolysis, Fermentation, Macroalgae, Polyhydroxybutyrate

Polyhydroxyalkanoates (PHA), one of the most promising bioplastics, is produced via fermentation using a supplemented carbon source as the primary substrate. This study focused on the direct acid hydrolysis of Caulerpa spp. seaweeds, which are abundant and are well-suited for natural rapid cultivation, to extract sugars as carbon source for a preliminary PHA fermentation. A 2k factorial design was employed for the screening experiments, while a central composite design (CCD) was used to optimize sulfuric acid concentration and hydrolysis duration. The optimal acid hydrolysis condition achieved was 2.23% v/v H2SO4 concentration for 60 min, which produced a total reducing sugar yield of 20.61% w/w. Due to the high starch content and negligible lignin levels in Caulerpa spp., this study found that no pretreatment is required to effectively extract reducing sugars from the biomass prior to acid hydrolysis. However, the preliminary fermentation of PHA demonstrated limited microbial growth and negligible PHA accumulation, which suggests the generation of inhibitory compounds during the acid hydrolysis process. Therefore, it is recommended to explore post-treatment methods, such as the use of activated carbon prior to PHA fermentation.

PS3-4

Development of Decision Tool for Sorting Municipalities Among Centralized, Decentralized, And On-site Wastewater Treatment Systems Using Analytic Hierarchy Process Sorting II Method in the Philippines

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Keywords: Multi-Criteria Decision Analysis; Sorting Method; Wastewater Management; Hierarchical Analysis; Visual Basic Application

This study develops a decision tool to classify municipalities in the Philippines into decentralized, centralized, or on-site wastewater treatment systems. While Project DeWAMS, supported by the National Research Council of the Philippines, developed a checklist for assessing centralization levels, this study extends and applies that checklist using conventional MCDA tools, specifically AHP and its sorting extension, AHPSort II. By incorporating the checklist into a novel two-stage classification sorting algorithm, this research advances wastewater management decision-making. The first stage classifies municipalities between centralized and decentralized systems, while the second stage differentiates decentralized systems from on-site solutions. In the initial stage, expert analysis emphasized demographic criteria over socio-economic factors, identifying population density as the most critical sub-criterion (0.47), challenging traditional cost-centric approaches. The second stage highlighted economic considerations, with municipality income class emerging as the top criterion (0.183 weight), reflecting financial resource disparities among municipalities. Higher-income municipalities tended to favor decentralized systems, while lower-income municipalities leaned toward on-site solutions to balance efficiency with fiscal constraints. Technical skills (0.135) and water service level (0.107), underscore the role of technological and infrastructural capacity in decision-making. To properly streamline the effort, the decision framework was integrated in Visual Basic.

PS3-5

The Effects of Temperature on Biogas Production and Purity

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Keywords: methane, thermophilic, mesophilic, anaerobic digester, biogas purity

Agricultural wastes specifically crop residues and animal waste are produced in enormous volumes, making them a reliable source of materials for biogas production. This study intends to investigate the effects of temperature in the performance of anaerobic digesters for biogas production. Each digester was filled with 1:1 ratio of substrate to water, containing 15 kg of cow dung and 3 kg of crop waste. These materials were mixed in the digesters maintained at temperatures of 50±2°C and 30±2°C corresponding to thermophilic and mesophilic biodigester set-ups, respectively. The digesters were maintained at these temperature levels for 75 days and biogas samples were collected for subsequent measurement of biogas production rate and purity. Thermophilic digester produced 48.4% more biogas and had a slightly higher pH (7.65) reading than the mesophilic digester (7.37) by the end of the observation period. However, the gas analysis through chromatography showed that the CH_4 and CO_2 content of the two treatments were not significantly different, as both showed almost the same CH_4 and CO_2 contents. CH_4 in the mesophilic set-up was 42±10% while 53.5 ±10% for its thermophilic counterpart. The CO_2 composition was 32.5±1% and 35.5±1% for the mesophilic and thermophilic set-ups, respectively. These results were supported by the energy content of the biogas as indicated by the wavelength of the flame color from the two treatments, which were both in the range of 460 to 620 nm, indicating that biogas from both set-ups is predominantly composed of methane. Conclusively, this study demonstrated that thermophilic anaerobic digesters may have higher biogas production rate, but biogas purity is not significantly different with that of a mesophilic counterpart.

PS3-6

Optimization of Nutrient Conditions for Enhanced Polyhydroxyalkanoate (PHA) Bioplastic Production in *Pseudomonas putida* KT2440 Using Coconut Oil

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Keywords: biodegradable, carbon source, fatty acid, oil

As the global plastic pollution situation becomes more severe, polyhydroxyalkanoates (PHAs), which are known for their ultimate biodegradability in almost every environment, provide a sustainable substitute for conventional plastics. Although PHAs are made by fermentation, little is known about the potential of utilizing coconut oil as a substrate. The study employed a nutrient optimization strategy to improve the PHA fermentation of Pseudomonas putida KT2440 from coconut oil. To optimize PHA yield, the ratios of carbon to nitrogen (C/N) and carbon to phosphorus (C/P) were varied. According to preliminary results, hydrolyzed coconut oil supported better bacterial growth in comparison to untreated coconut oil. Thus, a 2k factorial design and response surface methodology (RSM) were employed, identifying optimal C/N and C/P ratios of 50:1 and 125:1, respectively, for the highest PHA production. This study provides baseline data for PHA production using coconut oil, contributing to its further development and potentially addressing plastic pollution while advancing the creation of a circular economy.

PS3-7

Optimizing Polyhydroxybutyrate Bioplastic Production by *Cupriavidus necator* KCTC 2649 Using Potato Peel Waste-Derived Starch Hydrolysates

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Keywords: bioplastics, fermentation, media optimization, polyhydroxyalkanoate

Potato peel waste (PPW) offers great potential as a sustainable source for producing polyhydroxybutyrate (PHB), an eco-friendly alternative to traditional plastics. This study investigated the production of PHB by *Cupriavidus necator* KCTC 2649 using starch hydrolysates derived from PPW as a carbon source. The yields of both starch (38.28%) and glucose (49.6%) were lower than literature values, likely due to variations in extraction methods and hydrolysis efficiency. Time-course fermentation experiments revealed that both biomass growth and PHB production peaked at 20 hours of fermentation, after which concentrations declined due to glucose depletion. Preliminary optimization experiments were conducted using response surface methodology (RSM) to evaluate the effects of carbon-to-nitrogen (C/N) ratio, carbon-to-phosphorus (C/P) ratio, and trace element solution (TES) volumetric loading on PHB production, biomass growth, and glucose consumption. Both C/N and C/P had negative effects on biomass concentration and glucose consumption but had a positive impact on the resulting PHB concentration. The results indicated that TES volumetric loading had an insignificant impact and was excluded from further optimization. The optimal fermentation conditions identified were a C/N ratio of 5 (g/g) and a C/P ratio of 7.7 (g/g). Under these conditions, the predicted outcomes were 8.51 g/L PHB concentration, 9.27 g/L biomass concentration, and 45.42% glucose consumption. Experimental validation closely matched the predicted values, achieving 8.55 g/L PHB concentration, 9.64 g/L biomass concentration, and 47.60% glucose consumption. This suggests that PPW could be a cost-effective source for PHB production, supporting both waste recycling and eco-friendly bioplastics.

PS3-8

Photocatalytic Degradation of Phenanthrene using Visible Light–Active Sb_2S_3–TiO_2 Composite Particles

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Keywords: photocatalysis, phenanthrene degradation, TiO2–Sb2S3 composite, visible light absorption, wastewater treatment

The persistence and toxicity of polycyclic aromatic hydrocarbons (PAHs) in wastewater presents significant environmental and health challenges, necessitating effective treatment solutions. This study investigates the photocatalytic degradation of phenanthrene, a representative PAH, using TiO_2–Sb_2S_3 composite under visible light. The Sb_2S_3 component was synthesized through a reflux method, followed by ultrasonication with TiO_2 to form the composite. Photocatalytic experiments were conducted in a batch reactor, varying catalyst load, pH level, and phenanthrene concentration. Results showed that the TiO_2–Sb_2S_3 composite achieved significantly higher removal efficiency (78%) compared to pure TiO_2 (45%) and pure Sb_2S_3 (60%) under identical conditions. Optimal degradation was observed at a phenanthrene concentration of 2.5 mg/L, a pH level of 5 (88% removal efficiency), and a catalyst load of 200 mg/L (78% removal efficiency). The findings demonstrate the potential of TiO_2–Sb_2S_3 composites as a cost-effective, efficient solution for mitigating persistent organic pollutants in wastewater, contributing to sustainable water quality management and environmental health improvements.

PS3-9

Effect of initial pH, initial concentration and current intensity on ciprofloxacin removal from pharmaceutical water using homogeneous electro Fenton

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Keywords: Ciprofloxacin; homogeneous electro Fenton; platinum electrode; emerging contaminants

Conventional methods of treating wastewater have been found to vary in their capability to remedy contaminants of emerging concern (CECs). Among these CECs are antibiotics such as ciprofloxacin (CIP). Trace amounts of CIP persist in untreated and treated effluent on the way back to larger bodies of water where microorganisms can interact with them, contributing to the antimicrobial resistance (AMR) phenomenon. In this study,laboratory scale removal of spiked CIP in water by platinum-platinum electro Fenton treatment was investigated. The effects of initial matrix pH (3 & 5), initial contaminant concentration (5, 25 & 50 ppm), and current intensity (0.5, 1.0 & 2.0 A) on the extent of removal of CIP were observed through a full factorial design. Analysis of the contaminant removal was done using high-performance liquid chromatography. Removal of ciprofloxacin by this method was up to 64% after 60 minutes. This maximum result was reached when the initial matrix pH was set to 5.00 and the greatest current intensity was applied during electrolysis.

PS3-10

Development of Polyethersulfone Membrane Embedded with Kappa-Carrageenan Derived Carbon Nanodots and its Potential for Cadmium (II) Removal from Water

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Keywords: kappa-carrageenan; CND; heavy metal; PES

This study addresses the contamination of aquatic environments by toxic heavy metals, particularly cadmium (Cd^{2+}), which poses significant health risks through bioaccumulation in seafood and plants. The goal of this research is to enhance the removal of cadmium ions from water using polyethersulfone (PES) membranes modified with carbon nanodots (CNDs) derived from kappa-carrageenan through the hydrothermal method. CNDs, with their excellent biocompatibility, fluorescence properties, and natural adsorption capabilities, were incorporated into PES membranes to improve their hydrophilicity and adsorption efficiency. The synthesized CNDs were characterized using TEM, UV-Vis spectroscopy, and FTIR confirming their successful formation and hydrophilic nature. PES membranes were then fabricated with varying concentrations of CNDs, resulting in membranes with increased water flux and enhanced permeability. The modified membranes showed significant improvements in hydrophilicity, as evidenced by a reduction in contact angle, and exhibited better mechanical flexibility compared to unmodified PES. Adsorption experiments revealed that the PES membranes incorporated with CNDs demonstrated a remarkable increase in cadmium adsorption, with the highest adsorption observed at 0.5% CNDs. These findings suggest that CND-modified PES membranes have considerable potential for efficient removal of cadmium and other heavy metals from aqueous solutions, offering a promising approach for water treatment.

PS3-11

Ciprofloxacin removal using homogeneous photo-Fenton process: Investigation on optimal operating parameters

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Keywords: photo-Fenton, advanced oxidation process (AOP), ciprofloxacin, antimicrobial resistance

Antibiotics, including ciprofloxacin, have emerged as significant environmental contaminants of concern due to their persistence and potential to contribute to antimicrobial resistance. Conventional wastewater treatment methods are often inadequate for removing trace concentrations of these compounds, resulting in their discharge into aquatic ecosystems. This study explores the potential of homogeneous photo-Fenton treatment as an advanced oxidation process for the effective removal of ciprofloxacin from wastewater. Focusing on large-volume applications, the research investigates the full factorial design on degradation efficiency under various operational parameters, including initial contaminant concentration (5, 25, and 50 ppm), hydrogen peroxide dosage (5, 25, and 50 mM), and UV light irradiation (11W) at fixed pH of 3.0, operation time of 1 hour, and iron concentration of 2 mM. The samples collected were immediately quenched to terminate the Fenton reaction and were allowed to settle for sludge formation. The samples were filtered and analyzed in ciprofloxacin concentration through high-performance liquid chromatography. Initial results show removal range of 27 to 100%, with runs at 25 mM H2O2 dosage at highest removal percentage at varying initial contaminant concentration and 11 W UV light irradiation.

PS3-12

Evaluation of Cadmium Removal from Landfill Leachate using Zeolitic Permeable Reactive Barrier (PRB)

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Keywords: in situ cadmium removal; zeolitic permeable reactive barrier; 3D-printing; numerical modelling

Permeable reactive barrier (PRB) is a widely used in situ treatment technology that is strategically constructed to intercept a polluted plume through a reactive material. Zeolites, renowned for their remarkable heavy metal adsorption, have recently been employed in solid structures for reactive adsorption showing great promise in wastewater treatment, particularly for highly polluted matrices like landfill leachate. This study aimed to investigate the potential of natural zeolites as adsorbents incorporated into 3D-printed PRBs for cadmium removal from synthetic sanitary landfill leachate. ANSYS simulations were initially conducted to assess the flow characteristics of square- and triangular-grid PRB designs embedded in leachate collection pipe. Results indicate steady state flow with a significant pressure drop for both designs indicating collision between solutes and the adsorbent material. Turbulent flows were also achieved upon entering the interstices of the PRB increasing dispersion and the chances of ion exchange. Experimental verification was then conducted by allowing continuous adsorption of cadmium-laden synthetic wastewater by a 3D-printed PRB installed in a pipe. Outlet concentrations were measured at time intervals ranging from 0.5 to 20 minutes. It was observed that the square- and triangular-grid PRBs were able to achieve maximum cadmium removal efficiencies of 5.91% and 23%, respectively, after 10 minutes. Beyond this, removal efficiencies gradually decreased indicating saturation and deactivation of adsorption active sites. Batch tests in pretreated zeolite were also performed in both cadmium standard and cadmium sulfate solutions showing that effective removal was achieved in less than one minute for the former, and in one hour for the latter that contains interfering ions. It is recommended to explore pretreatment methods for natural zeolite to increase its adsorption capacity, calcination techniques to free more active sites, and desorption techniques to assess the reusability and longevity of the PRB structure over repeated use.

PS4-1

Design and Performance Evaluation of An Alternative Redox Battery Using Different Electroactive Materials in a Chlorine-Diluted Solution for Powering a Thermoelectric Peltier Cooler

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Keywords: Redox flow battery, electrochemical storage system, energy storage, thermoelectric Peltier cooling system

The study aimed to design and evaluate the performance of an alternative redox battery for powering a thermoelectric Peltier cooler using different electroactive materials in a chlorine-diluted solution. Four (4) electroactive materials, namely aluminum (Al), copper (Cu), nickel (Ni), and iron (Fe), were used and configured into different pairings (Al-Cu, Fe-Cu, Fe-Ni, Al-Fe) to build the redox battery. The battery was then connected to a thermoelectric Peltier cooler system to evaluate its performance. Temperature, voltage, and time served as the key parameters for assessing the performance of the redox battery. In terms of temperature, it was observed that the Fe-Al configuration achieved the largest temperature drop, relative to the other configurations, where it dropped to 14.8 degrees Celsius from a 28.1 degrees Celsius starting temperature in a 30-minute observation period. In terms of daily voltage performance, it was observed that the same configuration also achieved the biggest voltage drop after a starting voltage of 18.4 V and after five (5) days of continued operation. From these results, it can be said that there is potential for the development of a battery using commonly found and readily available materials capable of providing power to a thermoelectric Peltier cooling system.

PS4-2

Carbon Footprint Assessment of Recirculating Tank and Pond Systems for African Catfish (*Clarias gariepinus*) in Sta. Cruz, Laguna, Philippines

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Keywords: aquaculture, carbon footprint; African catfish; greenhouse gas (GHG); emission inventory

Aquaculture plays a vital role in ensuring food security, yet its carbon footprint remains largely unexplored in the Philippines. This study aims to enhance understanding of carbon footprint in aquaculture systems, particularly in recirculating tank and pond systems. Using a combination of the PAS 2050 standard and IPCC 2006 Guidelines, the study followed the Business-to-Business approach, adopting a cradle-to-gate perspective in estimating the carbon footprint. It covers raw materials, production, harvesting & packaging, and distribution to market. The results show that the carbon footprint of a catfish farm using a recirculating tank is 12.04 kg CO_2 eq/kg live weight (LW) of catfish or 5006.91 kg CO_2 eq/yr, whereas the pond system ranges from 2.67 to 3.22 kg CO_2 eq/kg LW or 17.7 tons CO_2 eq/yr, depending on location. In both systems, the production phase is the largest contributor to emissions. Specifically, electricity accounts for 75.15% of emissions in the recirculating tank, while in the pond system, fish feed contributes 93% of the carbon emissions. Furthermore, the study also proposed mitigation strategies, including the adoption of solar energy and sourcing fingerlings from local suppliers, which showed potential for reducing emissions by up to 75.15%. These findings suggest that aquaculture, particularly African catfish farming, offers a more sustainable alternative to traditional livestock farming and can significantly lower the environmental impact of catfish production in the Philippines. Through the use of solar energy and access to nearby hatcheries for fingerlings, a reduction of 3.78 tons CO_2 eq/yr for recirculating tanks and 615.96 kg CO_2 eq/yr in catfish production can be achieved.

PS4-3

Characterizing Occupational Noise and Workers' Exposure Levels in a Coconut Manufacturing Plant: A Case Study in Company XYZ in San Pablo City, Laguna, Philippines

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Keywords: Occupational Noise, Hearing Protection Device, frequency, coconut manufacturing

Noise is a significant concern in the manufacturing sector, impacting both the auditory and non-auditory health of workers. A preliminary survey conducted in a coconut manufacturing plant revealed average occupational noise levels exceeding the Occupational Safety and Health Administration (OSHA) permissible limit of 90 dB(A) for an 8-hour workday. To address this problem, the noise environment was characterized based on its sources, intensity, duration, propagation, and frequency content. Additionally, the effectiveness of hearing protection devices (HPDs) in reducing noise exposure was evaluated. The findings indicated that the facility experiences fluctuating occupational noise levels throughout the 8-hour workday, resulting in noise events with varying sources, levels, and durations. Among the noise sources, deshelling machines were identified as the primary source of continuous noise, while the dropping of coconuts into bins caused short but intense noise bursts. By integrating the noise events, it was determined that workers in the office and paring area were exposed to low-risk environments, paring area II to medium risk, and deshelling and drilling areas to high-risk environments that exceeded the permissible noise limits. The analysis of noise frequency content revealed that mid-level frequencies (250 Hz to 2000 Hz) were the most prevalent across all areas, particularly in high-risk zones, while high-level frequencies were observed exclusively in these high-risk areas. The assessment of HPD effectiveness demonstrated that, although earplugs provided some noise attenuation, they were insufficient to lower exposure to safe levels in high-risk areas. Lastly, ergonomic interventions, including engineering controls, administrative controls, and improved HPDs, were recommended to minimize noise exposure.

PS4-4

Water Footprint Comparison of Constructed Wetlands for Wastewater Treatment Using Different LCI Databases

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Keywords: Constructed wetland, Life Cycle Assessment (LCA), Life Cycle Impact Assessment (LCIA), Life Cycle Inventory Analysis (LCI), Water Footprint

This study compares the water footprint of a constructed wetland for wastewater treatment using the Korea LCI Database and an international Life Cycle Inventory (LCI) database. The evaluation was conducted on a 100-ton-capacity constructed wetland, with the functional unit defined as one constructed wetland system. The Life Cycle Assessment (LCA) followed the ISO 14040 framework, and the water footprint was assessed using both the Korea LCI Database and Ecoinvent, one of the most widely used international LCI databases. The results revealed significant differences between the two databases, primarily due to variations in emission factors and regional data characteristics. The Korea LCI Database lacks comprehensive data on certain materials, leading to an underestimation of water footprint values compared to Ecoinvent. These findings highlight the need to enhance the completeness and accuracy of the Korea LCI Database to improve the reliability of water footprint assessments.

PS4-5

Assessing a digital image-based agricultural monitoring system using VTOL unmanned model aircraft

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Keywords: Agricultural monitoring system.Unmanned model aircraft, Vertical Take-Off and Landing, Digital image

In this study, VTOL (Vertical Take-Off and Landing) unmanned aerial vehicles (UAVs) are used to assess the possibilities of a digital image-based agricultural surveillance system. Because of these systems' efficiency, adaptability, and capacity to collect high-resolution data across a variety of terrains, they are being used more and more. The integration of VTOL UAVs for agricultural applications, such as yield estimation, crop health monitoring, and early pest identification, is the particular part of the study. The technical performance of the system is examined, and its accuracy, time efficiency, and cost-effectiveness are compared with those of conventional monitoring techniques. Advanced image analysis and machine learning techniques were used to process the data that was collected under various field settings. Key performance metrics were evaluated, including battery endurance, deployment ease, and spatial resolution. The findings show that VTOL UAVs offer precision agriculture a dependable and expandable platform. Operational flexibility is increased by the capacity to switch between vertical takeoff and horizontal flight, particularly in areas with restricted access. The study finds that the system has a great deal of promise to enhance resource management and agricultural output, but it also identifies areas that require more investigation, like automation and real-time data integration.

PS4-6

NATROSENSOR: A Web-Based Application for Detecting, Reporting, and Monitoring Antibiotic Residues in Wastewater (www.natrosensor.org)

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Keywords: natrosensor, web-application, python/Django, antibiotic monitoring, hospital wastewater

Antibiotics, classified as emerging organic pollutants, are significant contaminants in aquatic environments due to their excessive use and incomplete removal during wastewater treatment processes in pharmaceutical facilities, animal farming, and hospitals. Their presence poses environmental concerns, making it essential to implement effective detection and monitoring methods to track their pathways and assess the performance of wastewater treatment systems. To address this challenge, a web application has been developed to display the detected concentrations of antibiotics in wastewater samples. The application provides accurate and accessible measurements of antibiotic levels, which is essential for effective environmental monitoring and ensuring the safety of water systems.

PS4-7

Performance and Degradation Assessment of Solar Photovoltaic Modules in the Department of Electrical Engineering of the University of the Philippines – Los Baños

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Keywords: photovoltaic modules; performance ratio; performance monitoring; field conditions; degradation

Absence of performance monitoring data of photovoltaic (PV) modules specific to the environmental conditions of a location poses a challenge in accurately predicting the energy yield capability of a photovoltaic system which is significant for future optimization of the system. Following the IEC standard 61724, which is the standard for PV performance monitoring, the performance ratio of PV modules was calculated. Additionally, the degradation rate was also calculated. Two PV modules setup with the same model and manufacturing date were assessed in comparison to their performance at standard testing conditions (STC): three old PV modules exposed to field conditions and three newly opened PV modules. Even though the latter was newly opened, they exhibit green stains on the surface. Furthermore, two monitoring setups for data collection were developed: fully automatic monitoring setup utilizing microcontroller and semi-automatic monitoring setup utilizing partial microcontroller and electronic load. However, the former was not used due to the erratic current sensor. With that, the latter was chosen due to its consistency and accuracy. Under field conditions, the old PV modules unexpectedly outperformed the newly opened PV modules. Upon visual inspection of PV modules for signs of degradation, all newly opened PV modules exhibit a rainbow pattern on its one side, the side leaning on the ground when it was still stored, showing the significance of proper storage in the performance of the PV modules.

PS4-8

A Systematic Review of Current Instruments in Predicting Seismic Activities

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Keywords: Seismic Prediction; Earthquake Monitoring; Machine Learning; Neutral Networks; Disaster Preparedness

This paper discusses the instruments used to predict seismic activity, their limitations, and scope for improvement. The traditional dream of knowing that an earthquake is about to occur with some amount of precision is still not a reality because of the inherent chaotic and nonlinear nature of seismic processes, despite the overwhelming changes through technology and research. Techniques such as GMPEs, ANNs, and SVMs have improved the precision of prediction. However, each technique contains some problems regarding generalization, real-time processing, and sensitivity to noise. This paper critically reviews the instrumentation developed in the period from 2000 to 2025 and sets out their strengths, weaknesses, and contributions made toward further development in seismic prediction technologies.

PS4-9

Enhancing Coastal Urban Resilience through Sustainable Flood Solutions in Catbalogan City using HEC-RAS 2D

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Keywords: Antiao River Basin; Catbalogan City; Hydrologic Modeling; HEC-RAS

Flooding poses a significant challenge for coastal urban cities, leading to infrastructure damage, displacement, and fatalities. This study investigates the effectiveness integrating conventional flood mitigation (full-protection dikes) with nature-based solutions (NBS) like (mangroves and constructed wetlands) to enhance the resilience of and in Catbalogan City, Samar, Philippines, an area vulnerable to riverine flooding exacerbated by its coastal topography. Using HEC-RAS 2D, flood inundation models were created for various return periods (RPs) (10, 25, 50, and 100-yr), focusing on the 100-year inundation to assess the effectiveness of different flood control strategies in the Antiao River basin. The study found that full-protection dikes, when combined with coastal mangrove reforestation and constructed wetlands, significantly reduced flood extent by 86.52% or 13.68 hectares in critical built-up areas. These findings demonstrate the potential of integrating NBS with conventional flood management to enhance resilience of a coastal urban area to flooding. Overall, the study demonstrates how the city's coastal topography can be utilized to implement sustainable flood mitigation strategies to reduce vulnerability and enhance long-term resilience.

PS4-10

Mapping Current Trends in the Use of Industrial Waste for Enhanced Weathering: A Systematic Literature Review via Co-word Analysis

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Keywords: Enhanced weathering; Systematic literature review; Co-word analysis; Research trends; Industrial wastes

Enhanced weathering is an emerging climate mitigation solution, with industrial waste identified as a potential resource for its implementation. However, if industrial waste will serve as a viable alternative material source, it is essential to analyze current trends to better understand potential future developments. This research aims to examine enhanced weathering by analyzing current trends and research development using relevant keywords in research articles through a systematic literature review via a co-word analysis, with a focus on understanding the trajectory of industrial waste utilization in this field. A co-word analysis on enhanced weathering was conducted using bibliographic data from 148 screened articles downloaded from the Scopus database. The keywords were analyzed using VOSviewer and the results were visualized through a network visualization map to identify research trends. Results have shown that there have been researches on understanding industrial wastes as a source of material for enhanced weathering and has strong interrelationships with the need to understand the physical and environmental aspects and their applications for agriculture as a climate change mitigation solution. Since the field of industrial waste utilization is found to be underdeveloped, further research is required to expand the boundaries for improving enhanced weathering.

PS4-11

Wastewater Management Policies and Antibiotic Pollution in the Philippines: A Systematic Review

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Keywords: Antimicrobial Resistance (AMR); Antibiotic Residues; Wastewater Treatment Policies

The negligent use of antibiotics to treat microbial diseases and improper handling of wastes containing non-metabolized antibiotics and their residues are the primary drivers of the increase in antibiotic concentrations in the environment fueling the global health crisis of antimicrobial resistance (AMR). Despite high antibiotic pollution levels being widely documented, the issue is largely unregulated and quality assurance criteria typically do not address environmental emissions (Barathe et al., 2024; WHO, 2023). This systematic review aimed to evaluate existing wastewater management policies in the Philippines in addressing antibiotic residues and their role in AMR prevention. Guided by PRISMA methodology, relevant policies from various sectors were identified, categorized, and analyzed based on their scope and effectiveness in managing antibiotic contamination. Preliminary findings highlight critical gaps, while standards and policies for controlling pharmaceutical residues in wastewater and controlling the use and handling of antibiotics in the healthcare industry already exist, there is currently no formal policy governing the treatment and monitoring of antibiotic residues in wastewater discharges. This review underscores the urgent need for a comprehensive regulatory framework to manage antibiotic pollution in the environment and its contribution to AMR.

PS4-12

Modeling of the Impact of Pumping Rate and Recharge Rate on the Saltwater Intrusion in Cataingan, Masbate using MODFLOW and SWI2

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Keywords: MODFLOW-2005; SWI2; pumping rate; recharge rate; saltwater intrusion

This study investigated the effects of recharge and pumping rate on the saltwater intrusion in the Cataingan aquifer in Masbate, Philippines. A numerical model using MODFLOW-2005 and SWI2 was constructed to predict the current and future behavior of the seawater-freshwater interface under various pumping and recharge conditions. These scenarios included baseline conditions with 2022 pumping rates, increased pumping (25%, 50%, and 100%), decreased pumping (25%, 50%, and 75%), increased recharge (25%, 50%, and 100%), decreased recharge (50% and 75%), and combinations of both. Additionally, long-term projections for 50 and 100 years under normal pumping rates were simulated. The findings revealed that increased pumping accelerates saltwater intrusion, while decreasing pumping and increased recharge mitigate its impact. However, increasing recharge alone had a less significant effect compared to decreasing pumping. Simulations of simultaneous changes in both rates showed that increasing both rates significantly worsened intrusion, with nearly identical effects to increasing pumping alone. Conversely, decreasing both rates mitigated intrusion but less effectively than decreasing pumping alone. The most effective strategy was decreasing pumping while increasing recharge, significantly reducing the risk of saltwater intrusion. To address these challenges, the study recommends sustainable groundwater management practices, including reducing pumping rates, promoting water conservation, and enhancing recharge. Moreover, improving modeling accuracy and incorporating factors like climate change and sea-level rise are crucial for future research. By following these recommendations, the long-term sustainability of the Cataingan aquifer can be ensured.

PS4-13

Nutrient Transport Model Simulation: Nitrate and Phosphate Distributions from a Seaweed Farm in Bongao, Tawi-Tawi, Philippines

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Keywords: MODFLOW-2005; MT3D-USGS; nitrate; phosphate; seaweed

Tawi-Tawi faces risks of nutrient pollution as excess fertilizer solutions for cultivating seaweeds have been directly discharged into the sea. With this, the aquifer of Sanga-Sanga Island in Bongao, Tawi-Tawi was modeled with Modular Three-Dimensional Finite-Difference Groundwater Flow Model - 2005 (MODFLOW-2005) and Modular Three-Dimensional Transport Model - United States Geological Survey (MT3D-USGS) to investigate the transport of nutrients from a seaweed farm through the aquifer as influenced by discharged nutrient mass per farming cycle, groundwater pumping rate level, and seaweed farm depth. Depth-averaged nutrient concentrations were monitored at observation points and Bongao Water District (BWD) Pumping Station 1 after 1,100 d. Among the individual factors, only nutrient mass yielded a significant and direct effect on the observed depth-averaged nutrient concentrations. The minimum and maximum contamination cases at Pumping Station 1 were also determined and simulated until 2,200 d and 3,300 d. For both cases, Pumping Station 1 nutrient concentrations reached 1 % of the farm's nutrient concentration after 120 d, equivalent to six farming cycles. In the maximum contamination case, phosphate concentrations at the farm and Pumping Station 1 were observed to reach and exceed the maximum allowable concentrations in water quality guidelines (WQG) for marine waters and freshwater, respectively. Hence, fertilizer utilization and waste management should be incorporated into farming practices as multiple nutrient sources can easily pollute the sea and contaminate groundwater sources.

PS4-14

Analyzing the Stormwater Quantity and Quality in a Residential Area Using Green-Grey Ratio

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Keywords: bioswale; low impact development; green-gray ratio; rainfall; stormwater management model

The increasing need for residential homes in recent years has sparked a surge in construction and widespread use of impervious surfaces, making management of stormwater difficult due to high volumes of runoff and build-up and wash-off of pollutants. The green-grey ratio is a new concept used with low impact development (LID) in urban planning to dictate the optimal green areas to leave in urbanized regions to regulate stormwater during wet events. This study aims to assess the stormwater quantity and quality of a residential area under varying green-gray ratio scenarios. Historical rainfall data from 2003 to 2023 under three percentiles (85th, 90th, 95th) was used in the assessment for disaggregation, and the Stormwater Management Model (SWMM) with bioswale LID technologies was used in the modeling process. Three sub-catchments have been assessed in terms of their runoff, infiltration, and pollutant concentrations including total suspended solids (TSS), total phosphorous (TP), lead (Pb), zinc (Zn), and copper (Cu). Rainfall analysis shows relatively high rainfall percentiles in the site, attaining a value of 34.27 mm, 51.89 mm, and 72.73mm for the 85th, 90th, and 95th percentile, respectively. Linear relationships have been observed in the correlation between the green-grey ratio and runoff and infiltration, wherein runoff decreases, and infiltration increases as the green-grey ratio increases. All pollutant concentrations depict declining linear trends at the 10-20% ratio marks before stagnating, indicating their efficiency in treating water quality even in small areas.

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Abstracts of Technical Paper Presentations

TP-1

Optimization and Sensitivity Analysis of Cell Separation in Serpentine Channels of Microfluidic Centrifuge using FLUENT and Response Surface Methodology (RSM)

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Keywords: microfluidics, cell separation, microcentrifuge, FLUENT, RSM

Microfluidic centrifugation utilizes curved channels or structure to induce drag, lift, and Dean forces, enabling the focusing of particles into specific streams for separation. In this study, serpentine channels were employed to provide curvatures. A 2K factorial design and Response Surface Methodology (RSM) were used to evaluate the sensitivity of the microfluidic centrifuge based on four key parameters: aspect ratio (width-to-height), number of serpentine sections, Reynolds number (Re), and particle size. Simulations were performed using Discrete Particle Modelling (DPM) through ANSYS FLUENT. The analysis identified the most sensitive factors as the aspect ratio, particle size, the interaction between Re and particle size, and the interaction between Re and aspect ratio. While the main effects of Re and the number of serpentine sections were statistically significant, their sensitivities were comparatively low. At optimum conditions, aspect ratio of 8 is preferred while optimal Re varies depending on the particle size. Since no. of sections had minimal effect and not involved in any significant interactions, the least number of 10 sections was preferred in optimization. The coded equation generated from RSM analysis can be used to predict efficiency of other particle sizes at different conditions.

TP-2

Identification of DNA Aptamers Against Beta-Lactam Antibiotics using Molecular Docking Simulation

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Keywords: aptamer, molecular docking, beta-lactam antibiotics, Gibbs free energy, Binding affinity

Antibiotics have become contaminants of emerging concern due to their wasteful use and inefficient removal during wastewater treatment in pharmaceutical facilities, animal farming, and hospitals. Effective antibiotic detection and monitoring are crucial for tracking the environmental pathways of these pollutants and assessing the capability of treatment facilities. Although conventional detection methods are reliable, they fall short in providing rapid and on-site measurement of antibiotic levels through simple and cost-effective tools. Meanwhile, increasing focus on the identification and application of aptamers as the primary receptor of biosensors led to the development of rapid, easy, cost-effective, and sensitive sensors for various micropollutants, including antibiotics. In this study, DNA aptamers with high affinity for penicillin and cephalosporin were identified using in silico techniques. Seven aptamer candidates were screened using their binding affinities for each antibiotic, with two top candidates selected for further testing. Notable aptamers against class penicillin were BTD_ATB_K4 and BTD_ATB_K6. For class cephalosporin, aptamer candidates BTD_ATB_K1 and BTD_ATB_K7 showed the highest affinity.

TP-3

Analysis of Barriers to Domestic Reclaimed Water Use in Metro Manila using Hierarchical DEMATEL and BWM

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In the looming water crisis in Metro Manila, Philippines, the country is currently exploring wastewater treatment plant effluents as a solution, directly converting them into potable water. In this study, strategies for implementing reclaimed water use (RWU) were developed using a hybrid approach combining hierarchical Decision-Making Trial and Evaluation Laboratory (h-DEMATEL) and Best-Worst Method (BWM). Hybridization was done by multiplying the prominence and relation values with the BWM weights. The prominence and relation graphs revealed that effective communication with stakeholders and the public is critical, addressing awareness gaps in the RWU process and reducing disgust factors. Implementers must also prioritize RWU system integrity to alleviate health concerns. Governance and behavioral barriers emerged as the weakest; intervention for these should occur last due to their low significance. The hybridized h-DEMATEL and BWM serve as a strategic tool for RWU acceptance in Metro Manila. Future studies can validate results through population surveys and explore additional barriers.

TP-4

Rapid Moisture Content Determination of Coarse-Grained Soil by Image Processing using Machine Learning Techniques

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Keywords: Soil moisture content; coarse-grained soils; image processing; machine learning

Soil moisture content is one of the important parameters in geotechnical engineering for assessing soil conditions. Oven-drying based on ASTM D2216 is a standard and commonly used method for determining soil moisture content but it is time-consuming and labor-intensive. However, advances in image processing and machine learning offer promising alternatives for engineering applications. This study explores the use of image processing and machine learning for rapid moisture content determination of coarse-grained soils based on the Unified Soil Classification System (USCS), specifically silty gravels (GM), well-graded sands (SW), and silty sands (SM). Image features such as grayscale, light threshold, and dark threshold values were extracted and analyzed using image processing. The results indicate that the image grayscale values decrease with increasing moisture content until soil saturation. Beyond 15% soil moisture content, the values slightly increased due to light reflections which serves as basis for the light threshold values. Dark spots in the images, present at 11-18% soil moisture content, were used as the basis for the dark threshold values. Using these features, several machine learning algorithms were employed to train the models. Among these, the Extra Trees Model was found to be the most suitable, with coefficient of determination (R2), mean absolute error (MAE), and root mean squared error (RMSE) values of 0.96, 0.01, and 0.018, respectively. The model performed well in predicting moisture content up to 24%.

TP-5

3D Printed Adsorbents using Activated Biochar derived from Sugarcane Bagasse for Ciprofloxacin Removal in Wastewater

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Keywords: Antibiotic; Ciprofloxacin; 3D Printing; Activated Biochar; Sugarcane Bagasse

The synthesis of sustainable materials combined with innovative technologies like 3D printing is a developing trend to address major environmental issues. Antibiotics, as one of the emerging contaminants of concern, have become a significant problem that needs to be addressed immediately due to their toxicity, which disrupts the ecosystem, and the occurrence of antibiotic-resistant genes, which renders current antibiotic treatments ineffective. This study developed a 3D-printed adsorbent and synthesized H3PO4-activated biochar derived from sugarcane bagasse to remove ciprofloxacin (CIP) from synthetic wastewater. The preparation and optimization of the 3D-printed adsorbents were done using the one-factor at-a-time (OFAAT) method. Sugarcane bagasse biochar (SBB) and activated biochar (SBAB) were compared in terms of adsorption efficiency and equilibrium capacity. The percent removal of CIP using SBB and SBAB were 46.29% and 64.08% respectively. The developed 3D-printed adsorbents will be integrated into a packed bed adsorption column.

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Abstracts of Poster Presentations

PP-1

Bio-Based Crack Solution: Utilizing Bacillus Megaterium For Concrete Crack Treatment

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Keywords: Bacillus megaterium; Concrete crack repair; Concrete durability enhancement; Microbial-induced calcite precipitation (MICP); Sustainable bio-based solutions

Concrete cracking presents a significant challenge to the durability and safety of structures. Traditional repair methods often fail to provide durable solutions, necessitating the exploration of innovative and sustainable approaches. One promising method is microbial-induced calcite precipitation (MICP), which uses bacteria to repair cracks and enhance concrete durability. While much research has focused on integrating bacteria into fresh concrete, the repair of aging, deteriorating surfaces remains underexplored. This study presents a bio-based approach utilizing Bacillus megaterium to enhance MICP for crack repair. The system combines a sodium alginate mixture with Bacillus megaterium and urea, along with a calcium acetate solution to promote calcite formation and seal cracks. The bio-solution will be applied to pre-cracked concrete samples and evaluated for crack-sealing efficiency, compressive strength, flexural strength, tensile strength, and sorptivity. Preliminary data indicate that Bacillus megaterium initiates MICP, forming spores that aid in crack sealing. The sodium alginate-based gel, combined with calcium acetate, has demonstrated improved crack penetration, promoting increased bacterial activity and more consistent sealing.
These findings are part of an ongoing study, and further analysis will be conducted to validate these results and assess their potential implications for concrete repair.

PP-2

Determination of the Physical and Mechanical Properties of Garlic (*Allium sativum* L.)

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Keywords: garlic; physical properties; mechanical properties; Ilocos White; Taiwan garlic

This study investigated the physical and mechanical properties of Ilocos White, a native Philippine variety, and a Taiwan variety (Kanso White). Ilocos White garlic bulbs were categorized into three sizes (Super Extra, Extra, and Primera). Physical properties, including bulb and clove dimensions, sphericity, number of cloves, and bulk density, were measured. Mechanical properties, including angle of friction on stainless steel and silicone rubber surfaces, and compressive behavior under loading, were also evaluated. Results showed that Taiwan garlic bulbs were generally larger with a geometric mean diameter of 39.57 mm and surface area of 5960.79mm^2 compared to all sizes of Ilocos white with geometric mean diameter ranging from 32.86 mm to 39.33 mm and surface area ranging from 3400.80 mm^2 to 4867.88 mm^2. Ilocos White bulbs exhibited greater sphericity ranging from 0.88 to 0.89 compared to the Taiwan bulbs with 0.84 sphericity. Ilocos White had a higher number of cloves per bulb ranging from 17 to 26 but predominantly composed of smaller cloves. Taiwan had the least number with 13 cloves but composed mostly of cloves of greater than 3g. Taiwan cloves are generally larger than Ilocos White cloves in terms of physical dimensions with a geometric mean diameter of 11.99 mm to 20.49 mm and 11.03 mm to 17.81 mm, respectively. The angle of friction was significantly influenced by surface type, bulb size, and orientation. Compression tests revealed that Ilocos White Super Extra size, had a higher maximum and rupture load of 409.92 N and 398.33 N compared to the Taiwan variety with maximum and rupture load of 352.02 N and 349.44N. These findings may provide essential data for the design of equipment for handling, processing, and storage of these garlic varieties, contributing to improved efficiency and reduced postharvest losses in the garlic production.

PP-3

IoT-based Storage Time Prediction of Raw Chicken Via Reflectance Spectrometry: Comparison of Generalized Linear (GLM) and Machine Learning (ML) Models

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Keywords: reflectance spectrometry; IoT, machine learning; raw chicken; storage time

Chicken is an important commodity in the Philippines. However, it is highly perishable and rapid quality assessment can minimize losses. This study aimed to utilize a locally fabricated micro-spectrometer along with two sets of models: Generalized Linear Model (GLM) and Machine Learning (ML) for predicting the storage time and quality of raw chicken from reflectance spectral data and colorimetric parameters. Chicken breast and thigh samples were analyzed for absorbance, wavelength inflection points, RGB, HSI, CMY, L*, a*, b*, and chroma. GLM regression analysis and model selection based on Mallows' Cp (Cp<number of parameters +1) and adjusted R^2(>0.95) generated two predictive models and showed that fresh chicken has a storage time of ~3 days, beyond which it is classified as physically spoiled. ML models showed that Gradient Boosted Tree (GBT) was sufficient to predictively model the fresh/spoiled samples. Comparison of GLM and ML showed that GLM equations approximate the accuracy, specificity, recall and F-scores of ML and can influence rapid assessment with short computing times.

PP-4

Performance Characteristics of Heated-Air Mechanical Grain Dryers Tested by The Agricultural Machinery Testing and Evaluation Center, Philippines

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Keywords: heated-air mechanical grain dryer, drying efficiency, thermal efficiency

Heated-air mechanical grain dryers are used to reduce the moisture content of freshly harvested grains by circulating ambient or heated air through the grain bulk using fans and blowers. In the Philippines, the performance of heated-air mechanical grain dryers is tested by the Agricultural Machinery Testing and Evaluation Center (UPLB AMTEC) using methodologies based on the PNS/PAES 202:2015. This study focused on characterizing the performance of the 290 units of heated-air mechanical dryers tested by UPLB AMTEC from 1985 to 2024. Test data from three (3) types of heated-air mechanical dryers were analyzed: flatbed, recirculating batch-type, and continuous flow, specifically for corn and palay as input materials. The dryers tested utilized either non-renewable (petroleum-based) or renewable (biomass) fuels, with some capable of using both for enhanced versatility in grain drying. The parameters for the minimum performance requirements specified in the PNS/PAES 201:2015—including moisture gradient, cracked grain percentage, static pressure, blower flow rate per ton of grain, and drying and thermal efficiency—were used to characterize the machines' performance. The percentage of the tested dryer units that did not meet the performance requirements was also determined. The results of this study will be useful in data-informed crafting of technical and policy recommendations for the review of the current provisions of the national standard's performance requirements and methods of test.

PP-5

Effectivity of Coconut Coir-Derived Hydrophobic Coating as a Corrosion Inhibitor for Steel Rebars in Reinforced Concrete

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Keywords: coconut coir; green corrosion inhibitor; stearic acid-ethanol solution; contact angle; salt spray test

Steel-reinforced concrete is prone to corrosion due to water penetration, compromising its structural integrity. Coconut coir (CC), an abundant lignocellulosic fiber, has recently emerged as a green corrosion inhibitor. This study determined the effectiveness of CC biochar-based hydrophobic coatings as a corrosion inhibitor for steel rebars. Varying concentrations of CC biochar were dispersed in 1:50 stearic acid-ethanol solution. The CC-coated samples exhibited significantly higher ($p < 0.05$) contact angles than the positive control. Standard 24-hour salt spray testing and weight loss evaluation found that 1.2% CC-coated samples had significantly higher corrosion resistance than positive control. Steel-reinforced concrete samples were prepared using a 1:2:4 cement-sand-gravel and 0.5 water-cement ratio. 0% CC-coated SRC samples exhibited significantly higher bond strength than other CC-coated SRC. 0.8% CC-coated SRC had comparable bond strength with those coated with a commercial corrosion inhibitor. Thus, 0.8% CC was determined as the optimal concentration for hydrophobicity, corrosion resistance, and bond strength. These findings promote sustainable solutions to steel corrosion.

PP-6

Development of a Wheel Slippage Measurement System for Four-wheel Agricultural Tractors

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Keywords: wheel slippage; four-wheel agricultural tractor; machine vision; artificial intelligence

Accurate mensuration is the most important aspect of agricultural testing and evaluation. One of the persisting challenges in this field of study is the development of an accurate, instantaneous, and simple to conduct method of measuring wheel slippage in four-wheel agricultural tractors. Wheel slip is defined as the sliding of the tractor wheels instead of gripping the soil surface, resulting in slower horizontal movement and loss of tractive and drawbar power. Improving this parameter will help in ameliorating fuel economy and field efficiency of tractors, which are considerable boosts to Philippine agricultural mechanization efforts. Current techniques in measuring wheel slippage include manual counting of wheel revolutions, the fifth wheel method, the front wheel method, the use of Doppler radar, and the use of satellite-based positioning systems. These methods have limitations such as imprecision, time-delayed results, applicability to certain types of terrain only, high cost, and difficult to setup. In this study, a system using machine vision and artificial intelligence was used to accurately and instantaneously measure the wheel slippage of four-wheel agricultural tractors. This system was tested on three terrains: concrete, untilled soil, and grass-covered soil. The results were compared to the output of two other methods, manual counting by a test engineer and the fifth wheel method.

PP-7

Evaluating Sediment Yield and Erosion Risk in an Urban Catchment Based on Land Cover using SWAT

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Sediments from urban regions can have significant impacts on receiving water bodies as pollutants from various sources can accumulate on the surfaces and be washed away by rainfall and accumulating runoff. The risk of erosion and sediment yield are intensified with rainfall, and therefore the need for assessment of larger watersheds has garnered research interest to determine critical regions in urban watersheds. Recent research has focused on modeling works such as the Soil and Water Assessment Tool (SWAT), although there are only limited studies on the applicability of SWAT to sedimentation, particularly in urban areas in developing countries in the Southeast Asian Region. This study aims to assess the water erosion and sediment yield in a tropical urban catchment based on various land use types across three development periods using SWAT and MUSLE. Results have shown positive relationships between sediment yield with precipitation, and the same is observed for deposition and washload. Urban land uses had a large correlation with sediment yield, which could be an issue considering that it takes up nearly 45% of the catchment. An erosion risk map was also generated based on land use data from 1969, 2000, and 2017, showing variability in crucial regions depending on its land use during the period. The results of this study can serve as a preliminary analysis on determining issues about water erosion and sediment yield in a catchment scale in the region.

PP-8

Assessment of the Efficiency of Bioretention Cells in a Tropical Catchment through Simulation Analysis

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Keywords: bioretention, imperviousness, Storm Water Management Model, urban stormwater runoff

Increasing development in tropical developing countries has led to an increase in impervious surfaces, worsening the hydrologic conditions in various areas that may contribute to the vulnerability of communities against storm events. Bioretention is a highly applicable low-impact development technology that can be implemented in areas concerning stormwater runoff control. As such, the study assessed the hydrologic performance and efficiency of bioretention cells in a tropical catchment using the Stormwater Management Model (SWMM). Simulation scenarios were based on the rainfall data obtained from 1980-2023, impervious cover conditions, and the level of implementation of bioretention cells across the catchment area. Results show a runoff reduction from 8.32 to 96.7%. The efficiency of the bioretention cell with a minimum of 40% runoff reduction is met when the ratio of the bioretention implementation is at least 10% of the sub-catchment area. The optimal bioretention cell implementation at the site is determined when there is at least an 85% impervious cover. This study deepens the understanding of the site conditions based on various input parameters to develop appropriate technology controls, emphasizing the importance of identifying site-specific design considerations through modeling and analyses before implementation.

PP-9

Decentralized Approach to Domestic Wastewater Management Systems in Developing Countries: A Systematic Review and Policy Recommendations

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Keywords: Sanitation and Wastewater Management, Policy Recommendation, Decentralized Wastewater Management Systems, Sanitation Systems

Sanitation and wastewater management continue to pose significant challenges for emerging economies. Recent reports indicate that billions of people still lack access to safe drinking water and basic sanitation services, leading to numerous health and environmental concerns. The Philippines is a country grappling with these challenges. A significant percentage of households still rely on poorly designed and poorly managed on-site systems, and only a small population are connected to sewerage networks. Despite the existence of policies aimed at safeguarding the nation's water resources, progress in improving sanitation and wastewater management has been slow. This stagnation can be attributed to a variety of political, economic, social, and technical factors. Consequently, there is an urgent need for a comprehensive review of the current policies and practices to better support stakeholders in executing sanitation and wastewater management projects. To address this gap, a policy guidance manual is created to assist the government agencies and other sectors in assessing the most appropriate wastewater management system (on-site, decentralized, centralized). The policy guidance manual combines the information gathered from policy analysis, stakeholder engagement activities, and technical aspects of existing on-site, decentralized, and centralized wastewater management systems (WMS). Based on the information gathered from various sources, the authors recommend streamlining the roles of various agencies, strengthening the capacity-building efforts for local government units (LGUs), and providing a more adaptable and differentiated approach to financial support mechanisms tailored specifically for LGUs. Addressing these critical issues will significantly improve the effectiveness and sustainability of sanitation and WMS in the Philippines.

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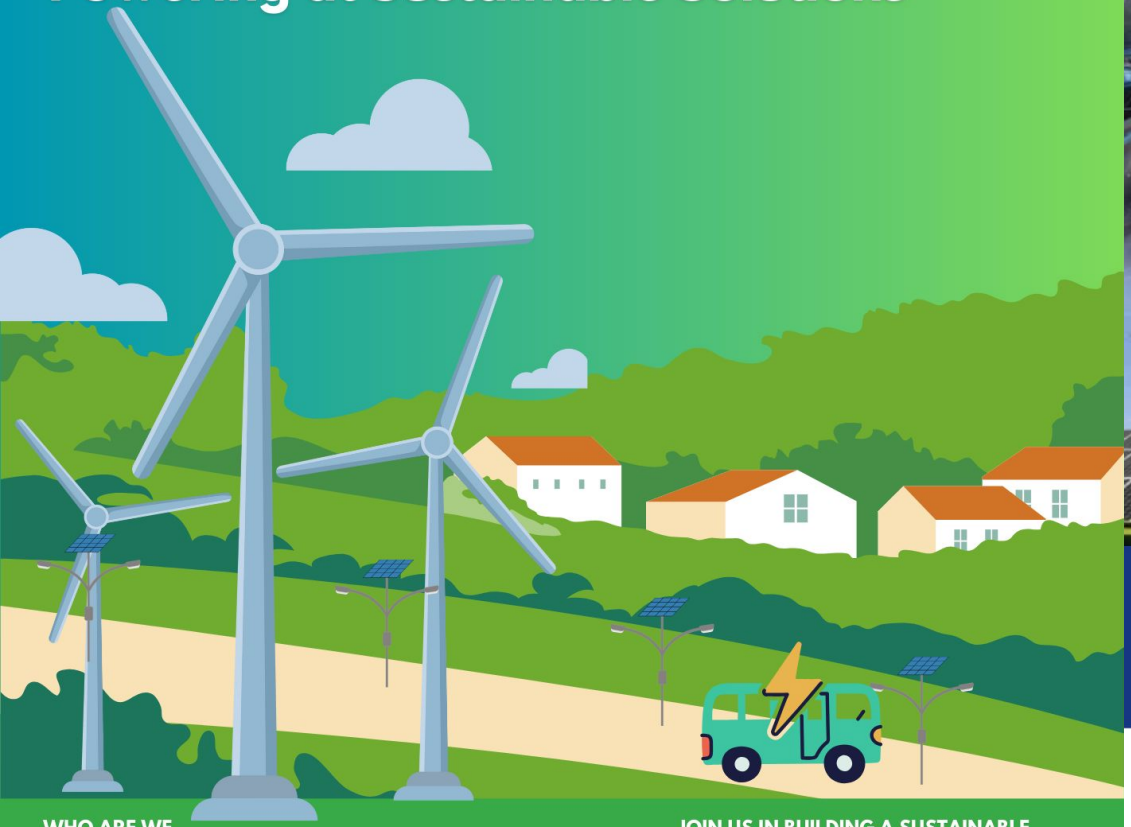

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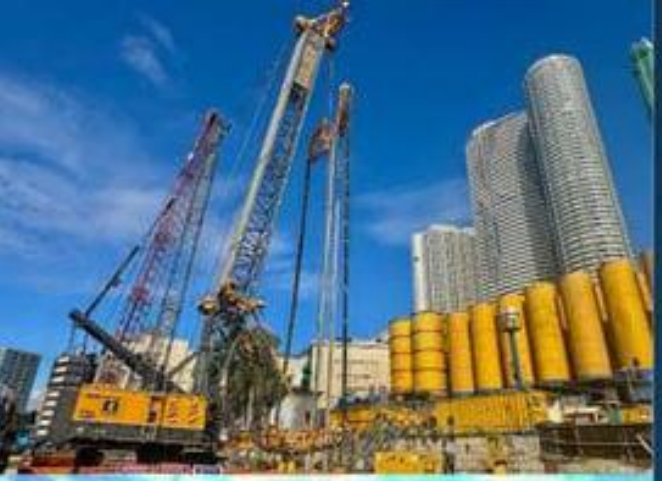

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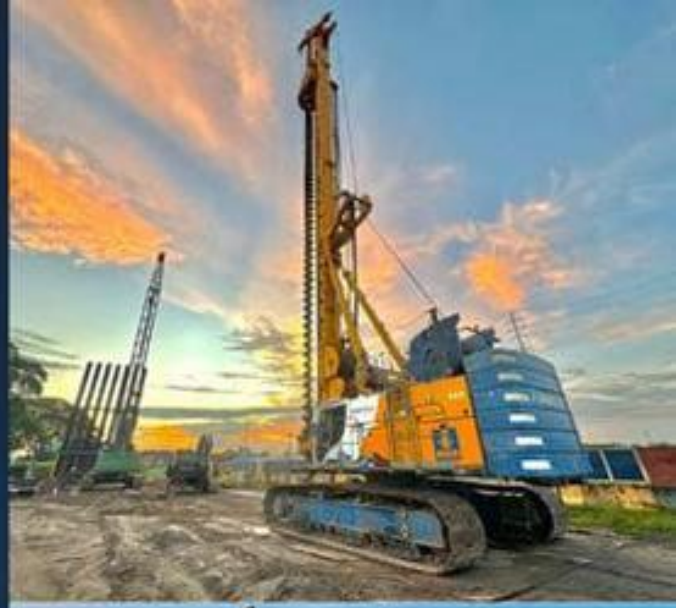

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