ECOCONVERGENCE 2026

IEPSL Annual Technical Sessions and Annual General Meeting

Institute of Environmental Professionals Sri Lanka

18th Annual Technical Sessions 2026

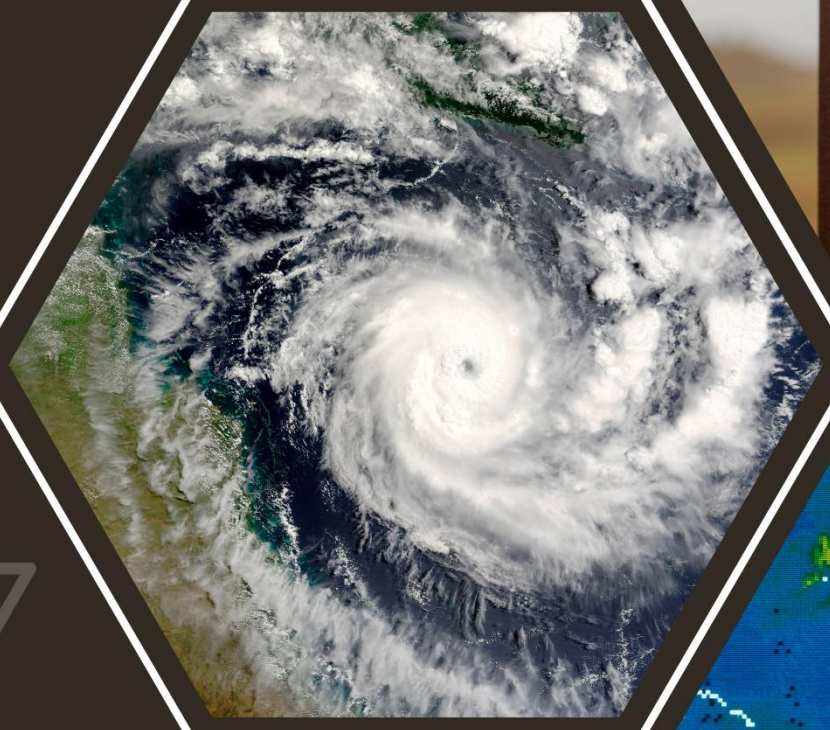
"Knowledge to Action for a Climate-Resilient Future"

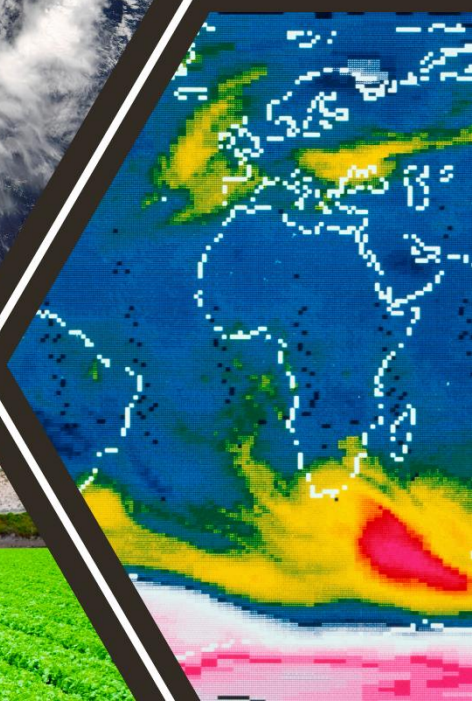
CONFERENCE PROCEEDINGS

ISSN: 3121-4118

11th - 12th March 2026

Galle Face Hotel, Colombo





www.iepsl.lk

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026

Proceedings

March 11-12, 2026

Colombo, Sri Lanka

Institute of Environmental Professionals Sri Lanka

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026

Copyright Notice

Proceedings of the Annual Technical Sessions, 2026

ISSN: 3121-4118

Published By:
Institute of Environmental Professionals Sri Lanka
Parisara Piyasa,
104, Denzil Kobbekaduwa Mawatha,
Battaramulla, Sri Lanka

Correspondence:
All correspondence related to the Proceedings of the Annual Technical Sessions, 2026 should be addressed to the Institute of Environmental Professionals Sri Lanka.

Postal Address:
General Chair-ATS 2026
Institute of Environmental Professionals Sri Lanka
Parisara Piyasa,
104, Denzil Kobbekaduwa Mawatha,
Battaramulla, Sri Lanka

Email: editor@iepsl.lk

Preface

The Organizing Committee of the Annual Technical Sessions 2026 of the Institute of Environmental Professionals Sri Lanka, is pleased to present this volume of proceedings under the overarching theme, "Knowledge to Actions for a Climate-Resilient Future." This theme reflects the urgent need to translate scientific knowledge, research findings, and innovative solutions into practical actions that strengthen resilience to climate change and environmental challenges.

This year's conference welcomed a wide range of contributions, including research findings, innovations, and practical experiences from academia, research institutions, and industry. The event served as a dynamic platform for knowledge sharing, dialogue, and collaboration among researchers, professionals, and policymakers dedicated to advancing environmental sustainability.

The technical program featured both oral presentations and poster sessions, organized under four key thematic areas: Climate Change, Risk & Environmental Informatics; Biodiversity, Ecosystems & Nature-Based Solutions; Sustainable Cities, Infrastructure & Green Innovation; and Circular Economy, Pollution Control & One Health. These themes highlight the multidisciplinary nature of environmental issues and the importance of integrated approaches in addressing them.

The Organizing Committee extends its sincere gratitude to all authors, presenters, reviewers, and participants for their valuable contributions and enthusiastic engagement, which have significantly contributed to the success of the conference. We also acknowledge the support of partner institutions and stakeholders who made this event possible.

It is our hope that the knowledge shared through these proceedings will inspire meaningful actions, foster innovation, and strengthen collaborative efforts towards building a climate-resilient and sustainable future.

Organizing Committee
Annual Technical Sessions 2026
Institute of Environmental Professionals Sri Lanka

Message from the President- IEPSL

It is with great pleasure that I extend my warm greetings to all participants of the Annual Technical Sessions 2026 of the Institute of Environmental Professionals Sri Lanka.

This year's theme, *"Knowledge to Actions for a Climate-Resilient Future,"* highlights a critical global priority in transforming scientific understanding and innovative research into practical, impactful solutions. As environmental challenges continue to intensify, the role of professionals in bridging the gap between knowledge and implementation becomes increasingly vital.

The Annual Technical Sessions serve as an important platform that brings together experts from academia, industry, and policymaking to share insights, foster collaboration, and promote sustainable practices. The diverse range of research presented this year reflects the commitment of our professional community towards addressing pressing environmental concerns through multidisciplinary approaches.

I would like to commend the authors, reviewers, and organizers for their dedication and contributions in making this event a success. Their efforts ensure the continued growth of knowledge, innovation, and professional excellence within the environmental sector.

I sincerely hope that the outcomes of this conference will inspire meaningful actions and strengthen our collective efforts towards achieving a sustainable and climate-resilient future.

Mr. Asela Iddawela
President
Institute of Environmental Professionals Sri Lanka

Message from the Editor – IEPSL

It is a privilege to present the proceedings of the Annual Technical Sessions 2026 of the Institute of Environmental Professionals Sri Lanka.

The collection of extended abstracts included in this volume reflects a diverse and high-quality body of work addressing contemporary environmental challenges. The contributions span multiple disciplines and thematic areas, demonstrating the importance of integrated and innovative approaches in advancing environmental sustainability.

All submissions underwent a rigorous peer-review process to ensure the quality, relevance, and scientific merit of the work presented. I would like to express my sincere appreciation to the reviewers for their time, expertise, and commitment in maintaining the academic standards of the conference.

The proceedings capture valuable research findings and practical insights that contribute to the broader discourse on climate resilience, environmental management, and sustainable development. It is our expectation that this body of work will serve as a useful resource for researchers, professionals, and policymakers, and will encourage further research and collaboration.

I would also like to acknowledge the efforts of the organizing committee and all contributors who have made this publication possible.

Dr. Sampath Wahala
Editor
Institute of Environmental Professionals Sri Lanka

Message from the Chairperson- ATS 2026

It is my great pleasure to welcome you to the Annual Technical Sessions 2026 of the Institute of Environmental Professionals Sri Lanka, held under the timely and significant theme, "Knowledge to Actions for a Climate-Resilient Future."

In the face of escalating climate risks and environmental challenges, the need to translate knowledge into meaningful action has never been more critical. This year's conference serves as a platform to bridge the gap between research, innovation, and real-world implementation, bringing together experts from academia, research institutions, industry, and policy sectors.

The conference has attracted a diverse range of high-quality submissions, reflecting current advancements and practical solutions across key thematic areas: Climate Change, Risk & Environmental Informatics; Biodiversity, Ecosystems & Nature-Based Solutions; Sustainable Cities, Infrastructure & Green Innovation; and Circular Economy, Pollution Control & One Health. The inclusion of both oral and poster presentations has further enriched the exchange of ideas and fostered meaningful discussions among participants.

I would like to extend my sincere appreciation to all authors for their valuable contributions, and to the reviewers for their dedication in maintaining the quality and integrity of the conference. My gratitude also goes to the members of the organizing committee, partners, and all stakeholders whose commitment and support have made this event a success.

I am confident that the insights and knowledge shared during these sessions will inspire collaborative efforts, innovative thinking, and actionable solutions towards building a climate-resilient and sustainable future.

Dr. Udayagee Kumarasinghe
Chairperson
Technical Committee
Eco-Convergence 2026
Institute of Environmental Professionals Sri Lanka

Technical Committee Eco-Convergence 2026

Chairperson
Dr. Udayagee Kumarasinghe

Scientific Committee
Ms. Kanthi De Silva
Mr. Ajith Ethugala
Dr. Sampath Wahala
Dr. Tharindu Ritigala
Mr. Indrajith Udaya Kumara
Ms. Kasuni Wimalasena
Dr. C.K. Muthumala
Dr. Kasunthi Amarasekara
Dr. Pradeep Gajanayake
Dr. Nilanthi Rajapakse
Ms. Shamali Rathnasiri

Poster Session in-charge
Dr. C.K. Muthumala

Conference Secretaries
Mr. Indrajith Udaya Kumara
Mr. Trishan Perera

Finance and Sponsorships
Mr. Janaka Wijesekara

Logistics Management
Mr. Trishan Perera
Ms. Kasuni Wimalasena

Publications Coordination
Dr. Kasunthi Amarasekara
Ms. Shamali Rathnasiri
Ms. Terancy Samarawickrama
Mr. Indrajith Udaya Kumara
Ms. Kasuni Wimalasena

Awards and Certificates
Dr. Sampath Wahala
Ms. Kasuni Wimalasena
Archt. Kasun Wickramage

Marketing and Communication
Ms. Chathuri Liyanage
Mr. Bhanuka Gunathilake
Eng. Janaka Ratnakumara

List of Reviewers

Prof. Nilushi Nugara
Prof. Rohan Dassanayake
Dr. Anushka Bandara
Dr. Bhagya Nathali Silva
Dr. Bhagya Nallaperuma
Dr. C. K. Muthumala
Dr. D. L. Chamara Liyanage
Dr. F. S. Idroos
Dr. H. M. C. M. Jayawardana
Dr. I. S. K. Wijayawardane
Dr. Kasunthi Amarasekara
Dr. L. D. Lekamge
Dr. M. G. G. Awanthi
Dr. M. M. J. G. C. N. Jayasiri
Dr. P. A. Koliyabandara
Dr. P. A. K. C. Wijerathna
Dr. P. L. M. Prabhani
Dr. Pasan Bandara
Dr. Pradeep Gajanayake
Dr. R. M. R. Nilanthi Rajapakse
Dr. Ruwanga Amarasingha
Dr. Ruvini Abhayapala
Dr. Sankalya Ambagaspitiya
Dr. Shishanthi Jayarathna
Dr. Sonia Jayasekara
Dr. Sumudu Mapa
Dr. T. Manori Perera
Dr. Tharindu Ritigala
Dr. Udara Arachchige
Dr. Udayagee Kumarasinghe
Mr. Chameera De Silva
Ms. Chathuri Tharanga Liyanage
Ms. C. P. Rupasinghe
Mr. E. G. S. Niranjan
Ms. H. G. T. P. Samarawickrama
Mr. Indrajith Udaya Kumara
Ms. Kasuni Wimalasena
Ms. Kaushika Seelanatha
Mr. Prabath Samarasinghe
Mr. R. A. D. C. Ranathunga
Ms. Shamali Rathnasri
Ms. Sankani Heenkenda
Mr. Yasantha Gunarathna

ATS Sessions

- Climate Change, Risk & Environmental Informatics
- Biodiversity, Ecosystems & Nature-Based Solutions
- Sustainable Cities, Infrastructure & Green Innovation
- Circular Economy, Pollution Control & One Health

Table of Contents

Preface ..... **iv**

Message from the President- IEPSL ..... **v**

Message from the Editor – IEPSL ..... **vi**

Message from the Chairperson- ATS 2026 ..... **vii**

Technical Committee Eco-Convergence 2026 ..... **viii**

List of Reviewers ..... **ix**

ATS Sessions ..... **x**

Table of Contents ..... **xi**

Climate Change, Risk & Environmental Informatics **1**

Quantifying the Economic and Recreational Impacts of the 2017 Eagle Creek Wildfire: A Difference-in-Differences Analysis of the Columbia River Gorge National Scenic Area 2

Trend Analysis of Mangrove Cover Change and Total Sediment Carbon in Kokkilai, Trincomalee, Sri Lanka. 3

GIS-MCDA-Based Flood Susceptibility Assessment for Disaster Risk Reduction and Emergency Preparedness Planning in Gampaha District, Sri Lanka 4

AI-Agent -Enable IoT Framework for Environmental Monitoring: Climate Change Impact Prediction Using Water Quality and Climate Sensor Data 5

The Role of Land Use Management in Enhancing Soil Carbon Sequestration for Climate Change Mitigation in the Muthurajawela Environmental Protected Area (EPA) and Wildlife Sanctuary 6

Assessing the Impact of Climate Modes on Evaporation Variability in Tropical Irrigation Tanks Using Machine Learning 7

Biodiversity, Ecosystems & Nature-Based Solutions **8**

Abundance and Diversity of Macro-Benthos in Chilaw Lagoon: A Baseline Assessment 9

Ecology and Habitat Associations of *Gracilaria salicornia* Along the Jaffna Coast, Sri Lanka 10

Spatial Water Quality Assessment and Pollution Source Identification in Kandy Lake, Sri Lanka: A Physicochemical and Analytical Approach 11

Synchronised Human and Elephant Behaviour on Roads: A Comparative Study of Elephants' Food Solicitation in Sri Lanka 12

Socio-economic Drivers of Income Variation in the Spiny Lobster Fishery along the Southern Coast of Sri Lanka 13

Evaluating the viability of *Aceria* mite-infested coconut seed nuts for seedling production: Towards sustainable coconut seed systems 14

Identifying Capacity Gaps in Biodiversity Conservation and Sustainable Land Management in Wet Zone Plantation Landscapes of Sri Lanka 15

Preliminary phytochemical screening of allelochemicals in *Dicranopteris linearis* and their effect on seed germination in selected lowland tropical forest species 16

Abundance and diversity of phytoplankton in Koggala lagoon, Sri Lanka 17

Identifying Migratory Bird Hotspots in Bundala National Park, Sri Lanka: A GIS-Based Participatory Mapping Approach 18

Do Terraced Paddies Improve Water Resilience in Upland Landscapes of Sri Lanka? 19

Sustainable Cities, Infrastructure & Green Innovation 20

Artificial Intelligence and Internet of Things Applications in Resilient Urban Energy Systems: A Systematic Review with Implications for Sri Lanka 21

Comparative Compressive Strength Performance of Concrete Using Conventional River Sand and Offshore Sand from Muthurajawela as Fine Aggregates 22

A Study on the Propensity of the Domestic Sector to Adopt Solar Energy in Anuradhapura District, Sri Lanka 23

Impact of Outdoor Advertising on Wayfinding and Navigation in Urban Streetscapes with special reference to Kurunegala City 24

A Comparative Study on Biogas Yield and Process Stability in Single-Phase and Dual-Phase Reactors 25

Circular Economy, Pollution Control & One Health 26

Synergistic Reinforcement of Starch Matrices: Investigating the Combined Effect of Natural Fiber (Banana Peel) and Antioxidant (Polyphenol) on Bioplastic Performance 27

Biosorption Modelling of Pollutant Removal from Groundwater and Surface Water Using *Azolla pinnata* and *Eichhornia crassipes* Biomass 28

Assessing Regulatory Framework and Role of Local Authorities in Promoting Urban Home Gardening in the Western Province of Sri Lanka 29

Eco-anxiety among Sri Lankan Undergraduates 30

Applicability of Oxidation Reduction Potential Monitoring to Assess Oxidative Treatment Efficiency of Chlorine and Ozone in Natural Waters: Iranamadu Reservoir, Sri Lanka 31

Volume Reduction and Recycling Potential of Mechanically Crushed Glass Waste in Sri Lanka 32

Detection of Multidrug-Resistant *Pseudomonas aeruginosa* in Drinking Water Sources in the Western Province, Sri Lanka 33

Pelletization of Biologically Treated Industrial Sludge for Sustainable Energy Production: Approach in Industrial Symbiosis 34

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions Climate Change, Risk & Environmental Informatics

Climate Change, Risk & Environmental Informatics

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions Climate Change, Risk & Environmental Informatics/005

Quantifying the Economic and Recreational Impacts of the 2017 Eagle Creek Wildfire: A Difference-in-Differences Analysis of the Columbia River Gorge National Scenic Area

Mohan Heenatigala[1*], Sahan Dissanayake[2]

[1] *Forest Department Sri Lanka Sampathpaya", No. 82, Rajamalwatta Road, Battaramulla, Sri Lanka*
[2] *Portland State University, Oregon, 1825 SW Broadway, Portland, USA.*

**Email Correspondence: mohanhee@gmail.com*

Abstract

The Eagle Creek wildfire severely affected the Columbia River Gorge National Scenic Area in 2017, causing extensive damage to forest resources and major economic disruption in the states of Oregon and Washington. This study quantifies the wildfire's economic and recreational impacts using the Difference-in-Differences (DID) method. Real GDP, visitor numbers, per capita income, employment, and tourism-related expenditures were analyzed using data from 2012 to 2018. Wildfire-affected counties were matched with forested and non-forested control counties to isolate the effects of the fire. Results indicate GDP losses of approximately US$ 3,762 million in Oregon and US$ 1,686 million in Washington when forested counties were used as controls, with similarly large losses observed when non-forested counties were used. Visitor numbers, employment, and incomes declined significantly, with small tourism-related businesses particularly affected. The DID method proved effective in isolating wildfire impacts by comparing forested and non-forested control counties. Recreation-based economies are especially vulnerable to wildfires because closures, smoke, and evacuation orders directly reduce visitor demand. Small rural businesses, guides, and lodging operators were among the most severely affected. The findings demonstrate the significant economic vulnerability of recreation-dependent regions to wildfire events.

Keywords: *Wildfire, Difference-in-Differences, Economic impact, Recreation, Forested and non-forested counties*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions Climate Change, Risk & Environmental Informatics/006

Trend Analysis of Mangrove Cover Change and Total Sediment Carbon in Kokkilai, Trincomalee, Sri Lanka.

A. M. B. Alagiyawanna[1*], I. S. A. Hewapathirana[1,2], H. B. Jayasiri[1]

[1]*Center for Postgraduate Studies, Ocean University of Sri Lanka*
[2]*Department of Wildlife Conservation, Battaramulla, Sri Lanka*

**Email Correspondence: buddhimaisu98@gmail.com*

Abstract

Mangrove ecosystems play a critical role in carbon sequestration and coastal protection; however, data on their dynamics in many tropical regions remain limited. This study quantifies decadal land-cover change and sediment organic carbon stocks in the mangroves of Kokkilai Lagoon, Sri Lanka. Landsat imagery from 2013 and 2023, combined with NDVI analysis, indicated that the lagoon area expanded from 2,995 to 5,285.94 ha. Concurrent sediment sampling was conducted at 14 randomly selected locations during the early dry season (May–June 2024). Sediment cores were collected at three depth intervals (0–15, 40–60, and 90–100 cm) to analyze dry bulk density (DBD) and organic carbon (OC) content. Sediment analysis showed no statistically significant variation in dry bulk density with depth ($p = 0.460$; $F = 0.79$). However, organic carbon content varied significantly across depths ($p = 0.018$; $F = 4.84$), with surface sediments exhibiting the highest concentrations. Furthermore, a highly significant negative correlation was observed between dry bulk density and organic carbon concentration ($p = 1.567 \times 10^{-12}$; $F = 97.78$), indicating the diluting effect of mineral matter on carbon stocks. The total estimated organic carbon stock for the current 215.90 ha of mangrove forest is 22,996.82 ± 39.84 Mg C. This study highlights the rapid recent expansion of mangroves in Kokkilai Lagoon and provides a robust baseline demonstrating their substantial contribution to blue carbon storage, reinforcing the need for their conservation in national climate mitigation strategies.

Keywords: *Kokkilai Lagoon, Mangroves, Organic Carbon, Bulk Density, Total Sediment Carbon stock*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Climate Change, Risk & Environmental Informatics/008

GIS-MCDA-Based Flood Susceptibility Assessment for Disaster Risk Reduction and Emergency Preparedness Planning in Gampaha District, Sri Lanka

W.M.K Yasara*

Department of Geography, University of Peradeniya, Sri Lanka.

**Email Correspondence: a20giso42@arts.pdn.ac.lk*

Abstract

Flooding is a major environmental hazard intensified by climate change, leading to severe social, economic, and infrastructural impacts. The Gampaha District in Sri Lanka is highly vulnerable to flooding due to rapid urban development, wetland modification, and the loss of natural drainage systems, which increase surface runoff and reduce flood retention capacity. This study aimed to develop a comprehensive flood susceptibility map for Gampaha District to support Disaster Risk Reduction (DRR) and preparedness planning. The analysis was conducted using a GIS-based Multi-Criteria Decision Analysis (GIS–MCDA) framework with data collected during the 2024–2025 period. Seven flood-conditioning factors were incorporated: rainfall amount, distance from rivers, drainage density, elevation, land use, slope gradient, and distance to roads. A Flood Risk Index was generated using an integrated weighted overlay of these factors. The results indicate that 24.6% of Gampaha District falls under very high flood susceptibility, 37.5% under high susceptibility, 28.4% under moderate susceptibility, and 9.5% under low susceptibility. Very high and high susceptibility zones are predominantly concentrated in the southwestern lowlands, while the northeastern uplands exhibit comparatively lower flood vulnerability. The susceptibility map was validated using historical flood event data, demonstrating strong agreement with recorded inundation patterns. These high-risk areas, which coincide with densely populated and economically important zones, should be prioritized for early warning systems, flood shelters, and land-use regulations. The findings provide critical spatial information for strengthening DRR strategies, improving flood prediction systems, and promoting flood-resilient infrastructure to enhance community safety and resilience.

Keywords: *Flood susceptibility, GIS-MCDA, Disaster Risk Reduction, Preparedness Planning*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Climate Change, Risk & Environmental Informatics/011

AI-Agent -Enable IoT Framework for Environmental Monitoring: Climate Change Impact Prediction Using Water Quality and Climate Sensor Data

Rohini Chandralatha[1*], E.M.C.T. Edirisinghe[2]

[1]*British Institute of Engineering Technology (BIET), Colombo, Sri Lanka*
[2]*Vocational Training Authority of Sri Lanka (VTASL), Colombo, Sri Lanka*

**Email Correspondence: rohini.cha@gmail.com*

Abstract

Climate change has intensified the need for accurate, real-time environmental monitoring systems capable of predicting and managing its complex impacts. Traditional monitoring approaches are often limited by delayed data processing, fragmented datasets, and insufficient predictive capabilities. Recent advances in Artificial Intelligence (AI) and the Internet of Things (IoT) offer transformative opportunities to address these challenges. This paper proposes an AI-agent-enabled IoT framework that integrates intelligent agents with distributed sensor networks to predict climate change impacts through water quality and meteorological data. Building on recent studies in AI-driven environmental monitoring, the proposed framework leverages machine learning, deep learning, and autonomous AI agents to enhance data acquisition, real-time analytics, and decision support. The study synthesizes existing methodologies and proposes a multi-layer architecture, demonstrating that AI-agent-enabled IoT systems significantly outperform traditional monitoring approaches. Specifically, CNN-based models achieve high accuracy in environmental classification tasks, while LSTM models provide reliable forecasts of climate and water quality parameters. Furthermore, hybrid models combining CNNs and LSTM networks can be effectively employed for the spatial and temporal prediction of climate-related phenomena.

Keywords: *Artificial Intelligence, Agent, Internet of Things, Environmental Monitoring, Climate Change Prediction.*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Climate Change, Risk & Environmental Informatics/048

The Role of Land Use Management in Enhancing Soil Carbon Sequestration for Climate Change Mitigation in the Muthurajawela Environmental Protected Area (EPA) and Wildlife Sanctuary

Priyantha M.P. [1,3], Perera G.A.D.[2], Gunawardene A.R[2]. Rathanayake R.R.[3]*

[1]*Central Environmental Authority, Sri Lanka*
[2]*Department of Botany, Faculty of Science, University of Peradeniya, Kandy, Sri Lanka*
[3]*National Institute of Fundamental Studies, Hantana Road, Kandy, Sri Lanka*

**Email Correspondence:* renuka.ra@nifs.ac.lk

Abstract

Global warming mitigation has increased interest in carbon sequestration, with wetlands recognized as highly effective carbon sinks due to their ability to store atmospheric CO_2 in soils. Organic carbon accumulation in wetland ecosystems is faster and more pronounced than in upland ecosystems (Chen et al., 2021) because periodic anaerobic conditions reduce organic matter humification, while higher silt and clay contents promote carbon retention and stabilization. The Muthurajawela Marsh, Sri Lanka's only saline peat bog, is a vital coastal wetland that provides biodiversity support, flood control, water filtration, and climate regulation services. This study assessed soil organic carbon (SOC) stocks across two depth layers (0–15 cm and 15–30 cm) in eight land-use types within the Muthurajawela Environmental Protection Area (EPA) and Wildlife Sanctuary. Total SOC was determined for 204 soil samples using the modified Walkley oxidation method (Baker, 1976), and SOC stocks were subsequently estimated following the approach described by Benbi et al. (2015). SOC stocks varied significantly among land-use types. Marshy lands exhibited the highest SOC stocks (surface layer: 59.18 Mg ha^{-1}; subsurface layer: 53.42 Mg ha^{-1}), followed by mangrove forests (surface layer: 47.30 Mg ha^{-1}; subsurface layer: 49.30 Mg ha^{-1}) and coconut cultivations (surface layer: 47.56 Mg ha^{-1}; subsurface layer: 51.71 Mg ha^{-1}). In contrast, landfills and sand-filled areas showed the lowest SOC stocks. Statistical analysis (ANOVA) confirmed significant differences in SOC stocks across land-use types ($p < 0.001$). The findings highlight the strong influence of land use on soil carbon storage and emphasize the importance of conserving and sustainably managing wetlands to enhance carbon sequestration and climate change mitigation.

Keywords: *Carbon sequestration, Soil organic carbon, Land-use management, Wetlands, Climate change mitigation*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Climate Change, Risk & Environmental Informatics/056

Assessing the Impact of Climate Modes on Evaporation Variability in Tropical Irrigation Tanks Using Machine Learning

G.D.D.J Bandara*

Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

**Email Correspondence: dilandileepa@gmail.com*

Abstract

Tropical irrigation tanks are important for water security and agricultural sustainability in Sri Lanka; however, their evaporation dynamics under large-scale climate modes remain insufficiently quantified. This study quantified the influence of the El Niño–Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD), together with local meteorological drivers, on the evaporation of Huruluwewa Tank (HW). Daily evaporation data from 1 January 2013 to 31 December 2022 were obtained from the Divisional Irrigation Engineer's Office, Huruluwewa, while meteorological data were obtained from the NASA POWER Project. Climate indices, namely the Niño 3.4 Index and the IOD Index, were obtained from the National Oceanic and Atmospheric Administration (NOAA), USA. Long-term trends were assessed using the Mann–Kendall test with Sen's slope to evaluate secular changes. Differences in evaporation among climate phases were tested using the Kruskal–Wallis test. For predictive modelling of evaporation, the XGBoost algorithm was applied to a dataset of 3,585 observations, with 70% of the data used for model training and 30% for testing. SHAP (Shapley Additive Explanations) analysis was employed to quantify the contribution of individual predictors to evaporation estimates and to examine how phase-dependent climate variability influences extreme evaporation events. No statistically significant monotonic trend was detected ($p = 0.9659$, $\beta = 0.0089$ m³ day⁻¹), indicating that interannual climate oscillations dominate evaporation variability. Evaporation differed significantly among ENSO and IOD phases, with El Niño (54,466.96 ± 25,298.84 m³ day⁻¹, n = 890) and positive IOD (51,229.72 ± 16,286.43 m³ day⁻¹, n = 92) months exhibiting the highest values. The lowest evaporation was recorded during the negative IOD phase (22,416.15 ± 14,410.00 m³ day⁻¹, n = 215). The machine learning model predicted evaporation with high accuracy ($R^2 = 0.82$, RMSE = 9,765 m³), and SHAP analysis revealed that the Niño 3.4 Index, solar radiation, and the IOD Index were the dominant contributors, while air temperature, relative humidity, and surface temperature acted as secondary drivers. Phase-wise SHAP analysis indicated that the IOD modulated the magnitude of ENSO-driven evaporation anomalies. These findings highlight the importance of integrating climate mode information into evaporation estimation and irrigation tank management to improve climate-resilient water resource planning in Sri Lanka.

Keywords: *Climate Modes, Evaporation, Irrigation Tanks, Machine Learning*

Biodiversity, Ecosystems & Nature-Based Solutions

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/007

Abundance and Diversity of Macro-Benthos in Chilaw Lagoon: A Baseline Assessment

Hettige N. D.[1*], Gamage T. L.[2], Narangoda S.R.C.N.K.[1] and Weerasekara K.A.W.S. [1]

[1] *Environmental Studies Division, National Aquatic Resources Research and Development Agency, Colombo 15, Sri Lanka*
[2] *Department of Environmental Technology, Faculty of Technology, University of Colombo, Sri Lanka*

**Email Correspondence: nadeeshahettige83@gmail.com*

Abstract

This study examined macrobenthic community dynamics in the Chilaw Lagoon, Sri Lanka, to generate essential baseline data for a data-poor tropical system and to evaluate site-wise responses along environmental gradients. Sampling was conducted monthly from May to October 2024 at ten sites (CHL1–CHL10), spanning freshwater-influenced zones, mangrove margins, central brackish areas, and locations exposed to domestic and aquaculture effluents. At each site, three replicate Van Veen grab samples (0.025 m^2; 0.5 mm sieve) were collected on the same day within a consistent time window to minimize tidal and diel variability. Organisms were identified to the family level, and abundance was expressed as individuals per square metre (ind m^{-2}). A total of 4,223 individuals were recorded. Lagoon-wide composition was dominated by Mollusca (90.36%), followed by Arthropoda (9.36%) and Annelida (0.28%). Within Mollusca, Gastropoda (57.92%) and Bivalvia (32.44%) were the dominant classes. Potamididae (48.22%) and Corbiculidae (26.90%) were the most abundant families, with the highest densities recorded at CHL4–CHL5 under mangrove-influenced brackish conditions.
Biodiversity indices revealed strong spatial structuring: total abundance (N) ranged from 65 to 986 individuals, species richness (S) from 6 to 12, Shannon diversity (H′) from 1.14 to 1.74, and evenness (J′) from 0.46 to 0.83. Site-wise, richness was highest at CHL4, CHL5, and CHL8 (S = 12) and lowest at CHL10 (S = 6), while Shannon diversity peaked at CHL8 (H′ = 1.74) and was lowest at CHL6 (H′ = 1.14). Considering 180 grabs (total sampled area 4.50 m^2), the lagoon-wide mean density was approximately 938 ind m^{-2}. Overall, macrobenthic assemblages responded sensitively to salinity, nutrient enrichment, habitat complexity, and organic loading. The dominance of pollution-tolerant taxa at impacted sites and higher richness and diversity at mangrove-associated locations underscore the value of macrobenthos as site-specific, cost-effective bioindicators. These findings provide a robust baseline for long-term monitoring, restoration planning, and sustainable management of the Chilaw Lagoon.

Keywords: *Macro-benthos, Community structure, Biodiversity indices, Spatial variation, Coastal lagoon ecology*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/014

Ecology and Habitat Associations of *Gracilaria salicornia* Along the Jaffna Coast, Sri Lanka

T. Jananthini*, R.M.H.S. Rathnayake

Department of Bio-Science, Faculty of Applied Science, University of Vavuniya, Vavuniya, Sri Lanka

**Email Correspondence: ravijana349@gmail.com*

Abstract

Seaweeds are essential primary producers in coastal and marine ecosystems and play a vital role in maintaining ecological balance and supporting marine biodiversity. Sri Lanka, as an island nation, supports a diverse marine macroalgal flora comprising over 320 recorded seaweed species, which play a significant role in coastal ecosystem functioning and the national economy. Among these, *Gracilaria salicornia* is a dominant red macroalga along the Jaffna Peninsula. This study aimed to investigate the coastal distribution, ecological associations, and habitat-forming role of *G. salicornia* in intertidal and subtidal zones along the Point Pedro and Chulipuram west coast. Samples were collected from both habitats and examined for associated macroalgal species, epiphytes, and faunal assemblages, including organisms utilizing the beds as nursery grounds. A 100 m line transect was established parallel to the shoreline for sample collection, and this procedure was consistently maintained throughout the study period. Environmental parameters were recorded across the study sites, with averages of temperature 31.12 ± 0.51 °C, salinity 33.32 ± 0.54 ppt, and pH 8.04 ± 0.06, characterizing the typical habitat conditions. In intertidal zones, *G. salicornia* beds hosted five mixed macroalgal assemblages (*Padina* sp., *Caulerpa* sp., *Halimeda* sp., *Hypnea* sp., *Bryopsis pennata*), more than three epiphytes (*Amphiroa* sp., *Ceramium* sp., *Cladophora* sp., and unidentified green algae), gastropod epifauna (Asian horn snails), and nursery fauna (post-larval crabs, prawns, and *Nereis* sp.). Subtidal beds exhibited densely packed, well-grown thalli with reduced green pigmentation, lower epifloral attachments, minimal grazing, and alternative faunal attachments, including green sea slugs, barnacles, and small oysters. These findings demonstrate that *G. salicornia* forms structurally complex habitats that support both algal diversity and juvenile fauna, with clear differences between intertidal and subtidal ecological interactions. The study highlights the ecological significance of *G. salicornia* in coastal ecosystems and underscores the need for long-term monitoring of species interactions, grazing impacts, and community dynamics to inform sustainable coastal management and conservation strategies.

Keywords: *Gracilaria salicornia; Jaffna Peninsula; Floral and Faunal associations*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/023

Spatial Water Quality Assessment and Pollution Source Identification in Kandy Lake, Sri Lanka: A Physicochemical and Analytical Approach

M.D.H.M. Kumari[1*], A.M.S.T. Bandara[2], W.M.D.H. Wijekoon[1], A.D.S.N.P. Athukorala[1], N.H. Koralagedara[3], W.S.S. Gunathilaka[4], J.A.M.S. Jayathilaka[5], K.B. Jayasundare[6], I.R. Fernando[7]

[1]*Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Statistics & Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[4]*Department of Chemistry, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
[5]*Department of Oral Medicine and Periodontology, Faculty of Dental Science, University of Peradeniya, Peradeniya, Sri Lanka*
[6]*Gyeongsang National University, South Korea*
[7]*Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayawardhanapura, Nugegoda, Sri Lanka*
**Email Correspondence: hashanik@sci.pdn.ac.lk*

Abstract

Kandy Lake is a culturally and ecologically important freshwater body in Sri Lanka that has been increasingly affected by anthropogenic activities. This study evaluated spatial variations in water quality using physicochemical parameters and advanced analytical techniques. In August 2025, water samples were collected in triplicate from nine impacted sites (KT1–KT9) located near potential pollution inputs (hospital and hotel effluents, residential drains, and solid waste zones) and three reference sites (KC1–KC3) in relatively undisturbed areas. Temperature, pH, total dissolved solids (TDS), salinity, and electrical conductivity were measured within 24–48 hours of sampling using standard probes. Data were normalized using Z-scores, and one-way ANOVA ($\alpha = 0.05$) was used to compare impacted and reference sites. Ion chromatography (IC) quantified anion concentrations, while X-ray fluorescence (XRF) spectroscopy determined the elemental profile of composite samples. Significant spatial differences were observed, with impacted sites showing higher electrical conductivity ($F = 5.02$, $p = 0.032$), TDS ($F = 5.15$, $p = 0.030$), and salinity ($F = 4.52$, $p = 0.041$) compared with reference sites. These parameters were 41–52% higher at impacted locations, particularly at KT6–KT8 near hospital and hotel discharge points. Temperature ($p = 0.142$) and pH ($p = 0.460$) showed no significant differences. Chloride was the dominant anion, while phosphate (~770%), nitrate (36%), nitrite (23%), and sulfate (21%) were elevated at impacted sites. XRF analysis identified phosphorus (64.30%) and sulfur (25.44%) as dominant elements, with trace metals including chromium, manganese, iron, nickel, and copper detected at lower concentrations. Although all parameters remained within Sri Lankan regulatory and WHO limits, the results indicate clear spatial pollution gradients. These findings highlight the need for targeted remediation, including improved wastewater management and vegetated buffer zones, to protect this culturally and ecologically significant urban lake.

Keywords: *Kandy Lake, spatial water quality, anthropogenic pollution, Ion Chromatography, XRF*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/024

Synchronised Human and Elephant Behaviour on Roads: A Comparative Study of Elephants' Food Solicitation in Sri Lanka

Tharindu Muthukumarana*

Elephant Conservation Organisation, 108/10 Shalawa Rd, Mirihana, Nugegoda.

**Email Correspondence: tharinduele@gmail.com*

Abstract

Roads that traverse protected areas in Sri Lanka frequently facilitate interactions between elephants (*Elephas maximus maximus*) and motorists, including the provisioning of anthropogenic food. Such interactions can alter elephant behaviour, increase risks to both elephants and humans, and contribute to the development of emerging behavioural traditions. This study compares food-soliciting behaviour of elephants along two wildlife-frequented roads—the Buttala–Kataragama Road (B035) and the Habarana Road (A11)—to examine how traffic intensity, surrounding landscape features, and motorist behaviour influence elephant responses. Elephants were studied using focal-animal observations and a standardized ethogram, alongside records of traffic patterns, motorist behaviour, land use, and elephant body condition. Despite lower traffic on the B035 road, elephants there—primarily adult males—showed a much higher tendency to solicit food from motorists and remained on the road for extended periods. In contrast, elephants on the busier A11 road mostly fed on roadside vegetation or crossed the road without lingering. Body condition did not differ significantly between food-soliciting and non-soliciting males. On the B035 road, food solicitation by elephants and feeding by motorists appeared mutually reinforcing, resulting in a persistent behavioural pattern. Although elephants on the B035 road frequently occupied the roadway for extended periods, vehicle–elephant collisions appeared less frequent there than on the A11 road. This may be because motorists travelling along the B035, which passes through a more natural landscape than the A11, are more alert and anticipate elephant encounters, resulting in heightened driver attentiveness. Such increased vigilance likely improves driver reaction times and reduces the risk of collisions. If this pattern is consistent, management approaches that actively promote driver alertness—such as increased ranger presence or warning systems—could be trialled on other roads where elephants are commonly encountered.

Keywords: *Asian elephants, Food solicitation, Road ecology, Animal behaviour, Human–wildlife interactions*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/027

Socio-economic Drivers of Income Variation in the Spiny Lobster Fishery along the Southern Coast of Sri Lanka

Imani Herath[1*], M. Akila[2], S.W. Peiris, Upul S.P.K. Liyanage[3]

[1]*Department of Oceanography, Faculty of Fisheries and Ocean Sciences, Ocean University of Sri Lanka*
[2]*Department of Zoology and Environmental Sciences, University of Colombo, Colombo 03*
[3]*Marine Biological Resources Division, National Aquatic Resources Research and Development Agency, Colombo, Sri Lanka*
**Email Correspondence:* imanthiherath8@gmail.com

Abstract

The spiny lobster fishery is a vital small-scale artisanal activity along Sri Lanka's southern coast. This study assessed income variation by craft type, location, and target species using data from 331 fishing trips. Data were collected through daily catch sampling and fisher interviews conducted between March and May 2024 at the Tangalle lobster collection centre. Mean income per trip differed significantly among craft types (ANOVA, $p < 0.001$). Outboard Fibre-Reinforced Plastic boats (OFRP) (LKR 16,464.00 ± 7,886) generated the highest mean income, exceeding that of Non-Motorised Traditional Canoes (NMTC; LKR 5,449.00 ± 4,266) and diving operations (LKR 4,421.00 ± 2,386). Daily income also showed spatial variation, with the highest mean earnings recorded at Kudawella. Species-level analysis indicated that *Panulirus penicillatus* yielded the highest mean income (LKR 3,640.00 ± 2,656). These results highlight clear differences in economic returns across fishing methods and locations. To ensure sustainable management of the fishery, authorities should consider implementing craft-specific catch limits and gear regulations to prevent overexploitation by high-efficiency OFRP operations.

Keywords: *Spiny lobster fishery, Socio-economic analysis, Artisanal fisheries, Sri Lanka*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/031

Evaluating the Viability of *Aceria* Mite-infested Coconut Seed Nuts for Seedling Production: Towards Sustainable Coconut Seed Systems

Thilakarathne M.G.O.S.*, Dissanayake H.D.M.A.C., Liyanage W.L.A.M., Samarasinghe C.R.K., and Aratchige N.S.

Coconut Research Institute of Sri Lanka, Lunuwila, Sri Lanka

**Email Correspondence: oshanthilakarathne@gmail.com*

Abstract

A steady supply of improved planting material is essential for the sustainability of the coconut industry. Infestation of coconut by the *Aceria* mite (*Aceria guerreronis* Keifer) results in fruit scarring and reduced size, leading to high rejection rates of improved seednuts and, consequently, instability in seed supply. This study assessed the viability and early growth performance of seedlings derived from seednuts exhibiting different levels of *Aceria* mite damage. Rejected seednuts were grouped into three damage classes: deformed but normal-sized nuts due to mite infestation; size-reduced nuts without visible husk fissures; and size-reduced nuts with husk fissures caused by mite feeding, while undamaged seednuts served as the control. The experiment was conducted as a completely randomized design, and seedlings were raised in polybags under plant-house conditions. Germination percentage at 5 months, standard-compliant seedling percentage, and seedling growth parameters, height, collar girth, and number of leaves at 7 months were evaluated as per the general guidelines on coconut nursery management. Data were analyzed using one-way ANOVA at the 5% significance level. No significant differences were observed among treatments for germination percentage, standard-compliant seedling percentage, seedling height, collar girth, or number of leaves. These findings indicate that *Aceria* mite-infested seednuts can produce high-quality seedlings and may therefore be considered for inclusion in seedling production programs.

Keywords: *Coconut, Sustainable Seedling Production, Aceria gurreronis*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/034

Identifying Capacity Gaps in Biodiversity Conservation and Sustainable Land Management in Wet Zone Plantation Landscapes of Sri Lanka

W.M.S.B. Weerakoon*, D.L.P. Kulasekara, S.M.C.H. Samarakoon

[1]*National Institute of Plantation Management, Athurugiriya, Sri Lanka*

**Email Correspondence: shalithaweerakoon6@gmail.com*

Abstract

Plantation landscapes in Sri Lanka's wet zone are important for both the national economy and biodiversity conservation. However, limited information exists on plantation workers' capacity to support biodiversity-responsive and sustainable land management. This study assessed the knowledge, attitudes, and practices (KAP) of plantation workers and identified capacity gaps influencing sustainable land management across six districts in Sri Lanka. A cross-sectional survey was conducted among plantation workers in Galle, Kalutara, Kegalle, Matara, Nuwara Eliya, and Ratnapura using a structured interview schedule based on the KAP framework. Data were collected from 156 respondents and analyzed using composite indices and district-level statistical comparisons to examine spatial variation. The results indicated moderate levels of knowledge among workers, with mean scores ranging from 2.79 to 3.24. The lowest scores were recorded for endangered species management (2.79) and ecosystem services (2.90), while higher scores were observed for sustainable weed management (3.24) and land preparation (3.18). Attitudes toward sustainability were generally positive, with scores ranging from 3.14 to 3.43. Notably, practice scores often exceeded knowledge scores, resulting in negative knowledge–practice gaps in areas such as nutrient management, riparian corridor protection, and ecosystem services. Significant differences were observed among districts ($p < 0.01$), with Matara and Kegalle performing better overall than Kalutara and Ratnapura. Although plantation workers demonstrated positive attitudes and moderate engagement in sustainable land management practices, gaps in biodiversity-related knowledge, particularly in ecosystem services and endangered species management, limit the effectiveness of conservation outcomes. These findings highlight the need for targeted, context-specific capacity-building interventions and stronger institutional support to enhance biodiversity-responsive land management in plantation systems.

Keywords: *Sustainable land management, Biodiversity conservation, Plantation landscapes, Knowledge-Attitude-Practice (KAP), Plantation workers*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/035

Preliminary Phytochemical Screening of Allelochemicals in *Dicranopteris linearis* and their Effect on Seed Germination in Selected Lowland Tropical Forest Species

M. K. H. Pathmasena*, M. T. R. Fernando

University of Kelaniya, Kelaniya, Sri Lanka

Email Correspondence: kalinduhimantha99@gmail.com

Abstract

The invasive fern *Dicranopteris linearis* poses a significant threat to Sri Lanka's biodiversity through allelopathic interference. Recognizing that plant species exhibit varying responses to allelochemicals, this study conducted a preliminary phytochemical screening of *D. linearis* allelochemicals and evaluated their effects on seed germination in selected lowland tropical forest species. Fresh leaves and roots of *D. linearis* were air-dried (29°C, ~101 kPa, 20% RH) and powdered to prepare crude extracts using distilled water and acetone. Thin Layer Chromatography (TLC) was performed on silica gel 60 F254 plates using toluene:ethyl acetate (7:3) for acetone extracts and n-butanol:acetic acid: water (4:1:5) for aqueous extracts. Each separation was conducted in quintuplicate, and chromatograms were visualized under UV light (366 nm) and in an iodine chamber. Compound classes were tentatively assigned based on Rf values calculated from digitally quantified TLC plate images using ImageJ and cross-referenced with published Rf data. A seed germination assay was conducted using leaf extracts with five replicated Petri dishes per treatment (25 seeds per treatment) and aqueous *D. linearis* allelochemical solutions at concentrations of 5.0% (v/v) and 2.5% (v/v). Phenolics, flavonoids, terpenoids, and tannins were identified as major allelochemical groups with organ-specific allocation. Statistical analyses were performed using R and Minitab software packages, revealing significant dose-dependent inhibition of seed germination ($p < 0.05$) in most tested species, except for *Melastoma malabathricum* ($p = 0.112$). Post-hoc analysis using Tukey's HSD further confirmed that the allelopathic effects were species-specific among the tested plants. However, as TLC-based phytochemical profiling provides only preliminary evidence, definitive compound identification and quantification require further confirmation using advanced analytical techniques such as HPLC, GC–MS, and LC–MS.

Keywords: *Allelochemicals, Dicranopteris linearis, Invasive species, Seed germination, Thin Layer Chromatography*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/038

Abundance and Diversity of Phytoplankton in Koggala Lagoon, Sri Lanka

U.R.K.M. Jayaweera[1], M.D.S.R. Maddumage[2*], K.K.T.Nuwansi[1], S.Verlmaran[2], K.A.W.S.Weerasekara[2]

[1]*Ocean University, Colombo 15, Sri Lanka.*
[2]*National Aquatic Resources Research and Development Agency, Colombo 15, Sri Lanka.*

**Email Correspondence: shanudamaddumage@gmail.com*

Abstract

Phytoplankton are vital components of aquatic ecosystems, functioning as primary producers and forming the base of the food web. Their community structure and diversity provide valuable insights into the ecological status of lagoon environments. The present study investigated the spatial abundance and diversity of phytoplankton in Koggala Lagoon, a major coastal lagoon in southern Sri Lanka. Monthly sampling was conducted at ten sites representing different ecological zones from May to August 2025. At each site, a single water sample was collected during each sampling event and sampling was repeated monthly over four consecutive months providing temporal replication for the study. Water samples were collected in accordance with standard APHA methods and analyzed microscopically using standard taxonomic keys. Diversity was quantified using Shannon–Wiener index, species richness, and evenness. A total of 55 phytoplankton taxa belonging to 16 genera and four major classes were identified. The community was dominated by Dinophyceae (35%) followed by Chlorophyceae (29%) Bacillariophyceae (18%) and Ulvophyceae, (5%). Phytoplankton abundance varied notably across sites, with marginal lagoon stations showing the highest cell abundance, often exceeding 14,000 cells/mL, whereas central areas supported comparatively lower abundances, sometimes less than 5000 cells/mL. Clear spatial variation was observed across the lagoon. Central sites recorded the lowest abundance and richness, while marginal and peripheral sites exhibited comparatively higher values. The Shannon Wiener diversity index ranged between 2.2 and 2.7 indicating low to moderate diversity. Evenness values suggested that phytoplankton were relatively well distributed among taxa, with balanced community structures in most locations. These spatial patterns suggest potential localized environmental influences rather than distinct pollution hotspots. The findings provide essential baseline data for future lagoon monitoring and management.

Keywords: *Abundance, Evenness, Phytoplankton, Richness*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/041

Identifying Migratory Bird Hotspots in Bundala National Park, Sri Lanka: A GIS-Based Participatory Mapping Approach

D.B.C. Jayasinghe*, H.P. Nethmi Thathsarani

Department of Geography, Faculty of Humanities & Social Sciences, University of Ruhuna

Email Correspondence: chathurikaj@geo.ruh.ac.lk

Abstract

Bundala National Park, a Ramsar-designated wetland on the southern coast of Sri Lanka, plays a critical role as a wintering and stopover habitat for migratory birds along the Central Asian Flyway. Despite its international importance, limited research has integrated local ecological knowledge with geospatial techniques to identify migratory bird hotspot areas within the park. This study employed a GIS-based participatory mapping approach to identify and analyze spatial patterns of migratory bird distribution in Bundala National Park. Primary data were collected during 2024–2025 through participatory mapping exercises using a stratified sampling method involving 108 stakeholders from key occupational groups, including wildlife officers, safari jeep drivers, tourism guides, tourism-related workers, fishermen, and farmers. Participants were selected based on their long-term field experience and familiarity with bird habitats. Migratory bird distribution was classified into high-, moderate-, and low-density zones based on mapped observations from 2024–2025. The results indicate that high-density hotspots are strongly associated with wetlands, lagoons, tanks, and marshlands, particularly Embilikala Lagoon, Kok-ariya Tank, and sections of the Bundala Saltern. In contrast, areas with intensive infrastructure and salt production exhibited comparatively lower bird densities. The findings highlight the importance of wetland connectivity and participatory GIS in conservation planning and provide a scientific basis for sustainable habitat management, ecotourism development, and migratory bird conservation in Bundala National Park.

Keywords: *Migratory birds; GIS; Participatory mapping; Wetland hotspots*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Biodiversity, Ecosystems & Nature-Based Solutions/053

Do Terraced Paddies Improve Water Resilience in Upland Landscapes of Sri Lanka?

Bhagya Wickramasinghe[1*], Ishara Athauda[2], Chirath Chandrarathna[2], Savindi Hettiarachchi[1], Rohana Chandrajith[2], Dushmantha Jayawickreme[3]

[1]*Department of Environmental and Industrial Sciences, University of Peradeniya, Peradeniya, Sri Lanka*
[2]*Department of Geology, University of Peradeniya, Peradeniya, Sri Lanka*
[3]*Department of Earth Sciences, Southern Connecticut State University, New Haven, USA*

**Email Correspondence: bhagyaew@gmail.com*

Abstract

Terraced paddy cultivation is a traditional agricultural practice in the mountainous upland of Sri Lanka, yet its hydrological significance remains insufficiently identified. Increasing socioeconomic shifts have led to the increasing abandonment of these systems, raising concerns about potential impacts on regional water resilience. This study examined whether terraced paddy cultivation enhances water retention and deep soil moisture recharge compared to adjacent uncultivated land under intermediate zone climatic conditions. Field studies were conducted in Lamasooriyagama, an iconic terraced paddy system located in the Nuwara-Eliya district, within the Intermediate Zone Mid Country (IM1c) region. Soil moisture dynamics, air temperature, and relative humidity were monitored using automated sensors from January to April 2024, covering the late Northeast monsoon and early inter monsoon period. In addition, soil physicochemical properties were analysed at depths of 0-150 cm, including moisture content, electrical conductivity, organic matter content, micronutrients, and particle size distribution, across cultivated paddy field and adjacent uncultivated rural homestead land. Cultivated land subsurface soils maintained significantly higher moisture levels throughout the study period, with values not falling below 0.325 m^3 m^{-3}. Deeper layers in paddy fields remained largely stable despite short term atmospheric variability, whereas uncultivated land soils exhibit strong moisture fluctuations and near-zero moisture levels at depth. Cultivated land soils also showed higher organic matter in surface horizons and distinct vertical stratification compared to the uniform profiles observed in uncultivated soils. Despite the predominantly sandy texture of the region, long term paddy cultivation has structurally modified the soil by increasing water holding capacity, promoting gradual percolation, enhancing micronutrient retention, and improving deep soil water storage relative to adjacent uncultivated land. These findings demonstrate that terraced paddy systems function as effective hydrological buffers in upland landscapes, contributing to soil water regulation and potentially supporting groundwater recharge. Continued abandonment of these systems may therefore compromise regional water security.

Keywords: *Terraced paddy cultivation, groundwater recharge, soil moisture, soil water retention*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation

Sustainable Cities, Infrastructure & Green Innovation

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation /022

Artificial Intelligence and Internet of Things Applications in Resilient Urban Energy Systems: A Systematic Review with Implications for Sri Lanka

W.D.G.N. Bandara[1*], W.D.A.C. Bandara[2]

[1]*Department of Chemical and Process Engineering, University of Moratuwa, Sri Lanka*
[2]*Department of Electronic and Telecommunication Engineering, University of Moratuwa, Sri Lanka*

**Email Correspondence: gihaninb@gmail.com*

Abstract

Rapid urbanisation in Sri Lanka has intensified electricity demand while increasing exposure to climate-induced hazards, particularly monsoon flooding and grid instability. This systematic review synthesises peer-reviewed literature (2020–2025) on Artificial Intelligence (AI) and Internet of Things (IoT) applications in resilient urban energy systems, with specific implications for Sri Lanka. Fifty-eight studies were systematically reviewed using PRISMA guidelines across Scopus, Web of Science, IEEE Xplore, and Google Scholar. The findings indicate that AI-driven load forecasting, IoT-enabled anomaly detection, and distributed energy resource optimisation consistently demonstrate 20–40% energy savings and 15–40% reductions in outage duration under controlled or pilot conditions. However, simulation-based studies often assume high data quality, uninterrupted connectivity, and stable regulatory environments, which limits direct transferability to developing tropical contexts. Real-world pilot projects in South and Southeast Asia reveal stronger constraints related to network reliability, capital costs, and institutional coordination. Economic assessments show payback periods ranging from 3–7 years for smart building energy management systems and 5–10 years for solar-plus-storage optimisation, depending on tariff structures and available subsidies. Governance challenges including ambiguity in data ownership, cybersecurity risks, and fragmented regulatory mandates emerge as critical barriers to scalable implementation. A conceptual framework is proposed linking AI–IoT technological capabilities (forecasting, monitoring, and optimisation) with resilience outcomes (efficiency, reliability, and adaptive capacity), mediated by economic feasibility and governance readiness. Future research should prioritise longitudinal policy evaluation, lifecycle cost–benefit analysis, and large-scale demonstration projects in Colombo and other secondary cities. Although limitations include heterogeneity in reported metrics and limited empirical data from Sri Lanka, the evidence suggests that AI–IoT systems can significantly enhance urban energy resilience when supported by coordinated policy reform and institutional capacity development.

Keywords: *Artificial Intelligence, Internet of Things, Urban energy systems, Energy resilience, Smart cities, Sri Lanka*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation/030

Comparative Compressive Strength Performance of Concrete Using Conventional River Sand and Offshore Sand from Muthurajawela as Fine Aggregates

S.N.C.M. Dias*, R.M.S.U.K. Ranathunga

Center for Environmental Studies & Sustainability Development, The Open University of Sri Lanka, Nawala, Sri Lanka

**Email Correspondence: sndia@ou.ac.lk*

Abstract

This study gives a comparison of concrete performance in terms of compressive strength produced with river sand and washed and sieved offshore sand as fine aggregates. G25 grade concrete mix was prepared using 100% of washed and sieved offshore sand instead of river sand which is used as a fine aggregate in conventional concreting. Standard sized concrete cubes (150 mm x 150 mm x 150 mm) were cast and subjected to compressive strength test at 7 days and 28 days under controlled conditions. Findings showed that river sand concrete had high compressive strength at testing ages and possessed normal strength increment with time. Conversely, offshore sand concrete demonstrated satisfactory early stage development of strength but was lower in compressive strength in 28 days. This behavior of abnormal strength can be explained through the particle form of a round shape, smooth surface texture, low interlocking, high entrapped air content and weaker interfacial transition zone that is related to the offshore sand. In the previous studies done, it has been identified that the chemical constituents available in the washed and sieved offshore sand are well within the allowable limits of the Sri Lankan Standards. Hence, the effect of the chemical properties of offshore sand on the quality of it can be stated as negligible. Nevertheless, offshore sand will become a sustainable alternative with an appropriate approach to its treatment, grading control, and mix design which will lead to minimized environmental degradation regarding excessive mining of river sand.

Keywords: *River sand, Offshore sand, Compressive strength, Fine aggregate, Sustainable concrete*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation/039

A Study on the Propensity of the Domestic Sector to Adopt Solar Energy in Anuradhapura District, Sri Lanka

S. Gunathilake, A.L.Y.H. Aruppala*

Central Environmental Authority, Anuradhapura, Sri Lanka

**Email Correspondence: harshaniaruppala@gmail.com*

Abstract

This study investigates the factors shaping household adoption of solar energy in Sri Lanka's Anuradhapura district, a region with high solar potential yet modest uptake. A structured questionnaire was administered to 337 households via random sampling, capturing socio-demographics, awareness, environmental attitudes, and views on infrastructure and service providers. Despite national commitments to renewable energy, residential solar adoption is only about 10.68%, constrained primarily by high upfront costs and limited awareness of available incentives. Grounded in the broader Sri Lankan energy transition driven by rising import costs, emissions concerns, and a shift from hydroelectric reliance, the research seeks to understand household awareness, motivations, and barriers to inform targeted policy and programs that can accelerate solar PV uptake at the community level. Findings indicate a high level of general awareness about solar energy, with strong interest driven by anticipated cost savings, environmental benefits, and energy independence. However, the primary barrier remains the upfront investment necessary to install solar systems, an issue cited by 85% of respondents as a deterrent. Awareness of government incentives is moderate, suggesting substantial potential for educational outreach and financing information. The data reveal that financial constraints override environmental concern in the decision to adopt solar, underscoring the need for policy measures that ease access to affordable finance and reduce initial costs. Household characteristics reveal a predominantly middle-aged, employed population with high home ownership, which facilitates installation, yet grid dependence remains substantial and current solar adoption remains low. Respondents demonstrate strong environmental values and a favorable view of infrastructure support, but low awareness of incentives persists. The analysis shows that knowledge of local solar providers enhances willingness to adopt, while income alone does not predict uptake, pointing to the salience of price reductions and information dissemination over income effects. Policy implications emphasize expanding incentive visibility, introducing low-interest loans, and building local capacity through training and technical support. Collaborative efforts among government, energy providers, and community organizations are essential to bolster finance, awareness, and infrastructure, leveraging Sri Lanka's climate advantages to promote sustainable energy, energy security, and climate progress in Anuradhapura.

Keywords: *Anuradhapura district, Domestic sector, Solar energy adoption, Propensity to adopt, Renewable energy policy in Sri Lanka.*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation/032

Impact of Outdoor Advertising on Wayfinding and Navigation in Urban Streetscapes with special reference to Kurunegala City

Ishara Thilakarathna*, Nadeeka Jayaweera

University of Moratuwa, Moratuwa, Sri Lanka

**Email Correspondence: isharamadhumali2000@gmail.com*

Abstract

The expansion of outdoor advertising, which has resulted in a congested and disordered streetscape, is one of the most pressing challenges. These advertisements often compete for attention, leading to cluttered visual landscapes that can overwhelm and confuse pedestrians alike. Therefore, it is very important to identify the impact of outdoor advertisements on visual pollution for enhance wayfinding and navigation in urban streetscapes. This research aims to understand how outdoor advertising impacts on pedestrians' ability to identify their way through the city especially by identifying street signs necessary for wayfinding and navigation with special reference to Kurunegala City, Sri Lanka. A mixed method approach was used combining pictorial analysis, and semi-structured interviews as sources of data collection and data collection was undertaken in 10 strategically selected highly commercialized locations to capture a variety of contexts where outdoor advertising might have impacts in Kurunegala city. Photographs of these 10 locations were processed using Photoshop and AutoCAD software to measure the level of outdoor advertising coverage as a percentage. Additionally, 60 semi-structured interviews were conducted with pedestrians, focusing on identify their ability to wayfinding and navigating through areas heavily populated with outdoor advertisements. The results of this study reveal that outdoor advertising is a substantial contributor to visual pollution in Kurunegala City. Specifically, integration of high advertisement density, large advertisement sizes, and poor placement significantly impacts the legibility of key wayfinding components such as street signs. This issue interferes pedestrians' ability to recognize crucial wayfinding cues, and leading to increased travel times, confusion, and distraction. This finding underscores the practical consequences of visual pollution; when critical navigational signs are hidden by advertising, the efficiency of movement within the urban streetscapes is compromised. By focusing on the needs of pedestrians, administrative bodies can improve the overall character of the urban streetscape and contribute to sustainable advertising practices that enhance the clarity of wayfinding cues in urban environments.

Keywords: *Advertisement, Visual Pollution, Wayfinding, Navigation, Urban streetscape*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions/ Sustainable Cities, Infrastructure & Green Innovation/067

A Comparative Study on Biogas Yield and Process Stability in Single-Phase and Dual-Phase Reactors

Y.R. Gunarathna [1*], A.N.N.P. Guruge,.[2], , U. Kumarasinghe [2], T.N.J. Munasinghe, [4]

[1]*Sisili Hanaro Encare (Pvt.) Ltd, Colombo 03, Sri Lanka.*
[2] *Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama 10206, Sri Lanka*

**Email Correspondence: yasantha@sisiliprojects.com*

Abstract

Biogas is a renewable energy produced through anaerobic digestion of organic waste. While single-phase reactors are commonly used, dual-phase systems can improve efficiency by separating hydrolysis–acidogenesis from acetogenesis–methanogenesis. This study at the Sisili Hanaro Encare facility compared the productivity of single-phase and dual-phase biogas reactor. The dual-phase system used two plastic tanks (2 m^3 and 10 m^3), while the single-phase system used one 10 m^3 tank. Both systems were fed daily with 25 kg of blended organic kitchen waste. Statistical results showed the dual-phase reactor produced more biogas (2.20 m^3/day vs. 1.58 m^3/day), achieved higher volatile solids removal (79.52% vs. 74.05%), and improved overall productivity. Gas yield data were statistically analysed using a t-test, which confirmed that the observed difference of 0.623 m^3/day was statistically significant ($t = 5.81$, $p < 0.0001$). This result indicates a meaningful improvement in biogas production when using the dual-phase system compared to the single stage reactor. The biogas produced in the dual-phase system also showed higher methane (CH_4) concentration (63.38%) than the single-phase system (56.55%). These findings demonstrate that dual-phase reactors enhance biogas yield, improve quality, promote waste stabilization, and increase process stability, making them a promising approach for sustainable energy generation from organic waste. Further research is ongoing to establish an automated effluent transfer mechanism based on volatile fatty acid (VFA) concentrations for commercial-scale implementation of dual-phase reactor systems.

Keywords: *Biogas, Anaerobic digestion, Single-phase reactor, Dual-phase reactor*

Circular Economy, Pollution Control & One Health

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/019

Synergistic Reinforcement of Starch Matrices: Investigating the Combined Effect of Natural Fiber (Banana Peel) and Antioxidant (Polyphenol) on Bioplastic Performance

M. Rudhra Premdharshan[1*], S. Vasantharuba[2]

[1]*Department of Agricultural Chemistry, Faculty of Agriculture, University of Jaffna, Sri Lanka.*
[2] *Department of Agricultural Chemistry, Faculty of Agriculture, University of Jaffna, Sri Lanka.*

**Email Correspondence: rudhra.premdharshan@gmail.com*

Abstract

The demand for sustainable materials has driven the use of agricultural residues to develop starch-based bioplastics as alternatives to conventional plastics. This study investigates the combined effect of polyphenol (PP) and banana peel (BP) on starch-based bioplastic properties. Four starch-based formulations were developed: P2B30 (2% PP, 30% BP), P2B60 (2% PP, 60% BP), P4B30 (4% PP, 30% BP), and P4B60 (4% PP, 60% BP), and characterized. Moisture content was highest for P4B60 (36.41±0.16%) and lowest for P2B30 (28.30±0.12%), whereas P2B60 and P4B30 showed intermediate values with significant difference (p<0.05). Thickness was highest for P4B60 (0.97±0.01 mm) and lowest for P2B30 (0.76±0.01 mm), whereas P2B60 (0.85±0.01 mm) and P4B30 (0.91±0.01 mm) were intermediate (p<0.05). Density was 1.12±0.02 (P2B30), 1.15±0.02 (P2B60), 1.17±0.02 (P4B30), and 1.19±0.02 g/cm³ (P4B60) with no significant difference between formulations (p>0.05). Tensile strength was highest for P4B30 (9.30±0.14 MPa) and lowest for P2B60 (5.32±0.13 MPa), whereas P2B30 (7.28±0.11 MPa) and P4B60 (8.45±0.12 MPa) (p<0.05). Elongation was highest for P2B60 (15.55±0.08%) and lowest for P4B30 (6.63±0.09%), whereas P2B30 (12.42±0.10%) and P4B60 (9.18±0.09%) (p<0.05). Total phenolic content (TPC) was highest for P4B60 (1.19 mg GAE/g) and lowest for P2B30 (0.94 mg GAE/g), whereas P2B60 (1.05 mg GAE/g) and P4B30 (1.12 mg GAE/g) (p<0.05). Antioxidant activity (AA) was highest for P4B60 (85.95±0.68%) and lowest for P2B30 (40.79±0.26%), whereas P2B60 (62.34±0.45%) and P4B30 (74.18±0.52%) (p<0.05). Biodegradability was highest for P4B60 (49.2%) and lowest for P2B30 (36.01%), whereas P2B60 (42.15%) and P4B30 (45.83%) (p<0.05). Results demonstrate synergy between natural fibres and antioxidants, supporting renewable bio-components as sustainable plastic alternatives.

Keywords: *Antioxidant activity, Banana peel, Polyphenol, Starch Bioplastics, Sustainable material*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/026

Biosorption Modelling of Pollutant Removal from Groundwater and Surface Water Using *Azolla pinnata* and *Eichhornia crassipes* Biomass

R.M.H.S. Rathnayake[1]*, T. Jananthini[1], G. Naveendrakumar[1], M.K.A.P. Kumara[2]

[1] *Department of Bio-Science, Faculty of Applied Science, University of Vavuniya, Vavuniya, Sri Lanka*
[2]*Department of Food Science and technology, Faculty of Applied Science, Sabaragamuwa University, Sri Lanka*

**Email Correspondence: hasinirathnayake123@gmail.com*

Abstract

The progressive decline in groundwater and surface water quality due to increasing physicochemical contamination has created an urgent demand for sustainable and economically viable treatment technologies. Biosorption using plant-derived biomass has emerged as a promising alternative because of its environmental compatibility, cost-effectiveness, and the presence of reactive surface functional groups capable of binding dissolved contaminants. Nevertheless, quantitative evaluation through adsorption modelling is necessary to assess performance reliability and to better understand the mechanisms governing pollutant removal. This study examines the adsorption characteristics of *Azolla pinnata* and *Eichhornia crassipes* biomass for the treatment of selected water quality parameters in groundwater and surface water systems. Batch biosorption experiments were performed under controlled laboratory conditions, and equilibrium data were interpreted using Langmuir, Temkin, and Liu isotherm models. Kinetic behavior was analyzed through pseudo-first-order and pseudo-second-order models. Model applicability was assessed using coefficients of determination (R^2) to ensure statistically reliable interpretation. Among the tested isotherms, the Langmuir model demonstrated comparatively better agreement for several parameters, including turbidity, phosphate, and hardness, suggesting the predominance of monolayer adsorption under certain experimental conditions. Variations in model performance were observed across different parameters and water matrices, reflecting the heterogeneous nature of natural water systems. Higher maximum adsorption capacities were generally recorded for *A. pinnata* in turbidity and phosphate removal, whereas *E. crassipes* exhibited relatively stronger affinity toward fluoride and total iron. Kinetic evaluation indicated improved fitting of the pseudo-second-order model in selected cases, implying that surface chemical interactions may contribute to the overall adsorption process. The removal mechanisms are likely governed by a combination of electrostatic attraction, ion exchange, and surface complexation facilitated by functional groups such as hydroxyl, carboxyl, and amino groups inherent in plant biomass. These results confirm the potential application of these aquatic macrophytes as sustainable biosorbents and emphasize the importance of rigorous adsorption modelling for predicting performance in practical water treatment systems.

Keywords: *Biosorption, Adsorption isotherms, Kinetic modelling, Azolla pinnata, Eichhornia crassipes*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/028

Assessing Regulatory Framework and Role of Local Authorities in Promoting Urban Home Gardening in the Western Province of Sri Lanka

M.P.F. Hana[1], M.U.N. Gunawardana[2], Shishanthi Jayarathna[3], Hasitha Priyashantha[3], K.P.P. Udayagee[1*]

[1] *Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama 10206, Sri Lanka*
[2] *Department of Agricultural Economics and Agribusiness, Faculty of Agriculture, University of Ruhuna, Mapalana, Sri Lanka*
[3] *Department of Animal Science, Faculty of Agriculture, University of Ruhuna, Mapalana, Sri Lanka*

**Email Correspondence: udayagee@sjp.ac.lk*

Abstract

Urban Agriculture (UA) is a practice that has been integral to the development of urban areas throughout history. It can also serve as a viable solution to the challenges posed by population growth and food insecurity in Sri Lanka's urban areas. However, policy support for promoting urban home gardening remains inadequate in Sri Lanka and other South Asian regions. This research aims to assess regulatory frameworks and the role of local authorities in promoting UA in Sri Lanka, with a particular focus on the Colombo District. The study employed a mixed-method approach, including a literature review, interviews with agricultural extension officers and academics, and a field survey of urban home gardeners in the Maharagama urban area. The objective was to identify existing challenges, the role of government in promoting urban home gardening, and policy gaps. The results reveal that national-level agricultural policies in Sri Lanka acknowledge the importance of home gardening and its promotion; however, there are no specific policies or guidelines tailored to urban home gardening. Policy frameworks in India and Nepal demonstrate the effectiveness of localized policies in promoting urban agriculture. Interviews with agricultural extension officers and academics highlighted the lack of institutional coordination and resource allocation for urban home gardening. However, they acknowledged grassroots-level awareness and the potential to promote urban home gardening among selected gardeners. In contrast, a field survey of 30 urban home gardeners revealed that respondents had no knowledge of urban home gardening policies (100%). Major barriers identified included pest and disease problems (63%), lack of space (60%), soil quality issues (37%), and health-related constraints (17%). The main motivations for practicing urban home gardening were reducing food costs and improving health and nutrition (90%). Edible gardening (100%) and container gardening (90%) were highly popular in the study area. Furthermore, interviews revealed that urban home gardening is not considered a distinct category within agricultural policies and is primarily practiced on a small scale by individuals. The study suggests that integrating clear guidelines and regulations related to marketing, food security, waste management, funding, and environmental sustainability could support urban home gardening, making it a more viable and sustainable practice.

Keywords: *Urban Home gardening, Policy gaps, Regulatory framework, Food Security*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/029

Eco-anxiety among Sri Lankan Undergraduates

W.M.V.D.B. Kindigoda[1*], Shamali Rathnasri[1], D.L.U. Amarakoon[2]

[1] *Department of Coastal and Marine Resources Management, Ocean University, Colombo, Sri Lanka*
[2] *Department of Psychiatry, University of Sri Jayewardenepura, Colombo, Sri Lanka*

**Email Correspondence: visuddhikak@gmail.com*

Abstract

Climate change and environmental degradation are increasingly recognized as significant determinants of mental health, particularly among young adults. Eco-anxiety defined as chronic fear or distress related to environmental degradation, has emerged as a growing psychological concern; however, empirical evidence from South Asia remains limited. This study aimed to assess the prevalence and dimensions of eco-anxiety among Sri Lankan undergraduates and to examine associated demographic and contextual factors. A cross-sectional survey was conducted among 476 undergraduates from 22 state and private universities across Sri Lanka. Participants (62.8% female; 37% male; age range 20-30 years) completed a structured questionnaire including the 13-item Hogg Eco-Anxiety Scale (HEAS-13; scale range 0-3), which measures four dimensions: affective symptoms, rumination, behavioral symptoms, and anxiety regarding personal impact. Descriptive statistics and inferential analyses were performed to examine group differences. Participants reported moderate levels of eco-anxiety ($M = 1.02$, $SD = 0.63$). Behavioral symptoms were the most prominent, indicating disruptions in sleep, social engagement, and academic functioning. Eco-anxiety levels differed significantly by year of study, residential vulnerability to environmental risks, and personal exposure to ecological impacts ($p < 0.05$). No statistically significant gender differences were observed ($p = 0.680$). These findings highlight the psychological burden associated with environmental change among university students in Sri Lanka. The results underscore the importance of culturally informed mental health interventions and institutional strategies aimed at fostering resilience while promoting constructive environmental engagement among young adults.

Keywords: *Climate change, Eco-anxiety, Ecological crisis, Mental health, University students*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/033

Applicability of Oxidation Reduction Potential Monitoring to Assess Oxidative Treatment Efficiency of Chlorine and Ozone in Natural Waters: Iranamadu Reservoir, Sri Lanka

R. Sajimeera[1], N. Anoja[2], J. Prabagar[1]

[1]*Faculty of Science, University of Jaffna, Post Box 57, Ramanathan Road, Thirunelvely, Jaffna, Sri Lanka*
[2]*National Water Supply and Drainage Board, Jaffna, Sivan Pannai Road, Jaffna, Sri Lanka*

**Email Correspondence: saimeerarajagopal@gmail.com*

Abstract

Oxidation–Reduction Potential (ORP) is widely applied as an operational monitoring parameter in drinking water treatment; however, its effectiveness as a performance indicator depends on the oxidant employed. This study evaluates the applicability of ORP monitoring for assessing chlorination and ozonation efficiency using surface water from the Iranamadu Reservoir, Sri Lanka. Bench-scale oxidation experiments were conducted using chlorine (0.2–4.0 mg/L) and ozone (0.1–0.5 mg/L), and treatment performance was evaluated through the removal of turbidity, color, iron, organic matter, algae, and microbial indicators, alongside ORP response. Ozonation achieved high removal efficiencies at low doses, including turbidity (60%), color (>80%), Chemical Oxygen Demand (COD) (20%), algae (58%), Biological Oxygen Demand (BOD) (40%), and complete Escherichia coli (E. coli) inactivation, despite only a marginal increase in ORP. In contrast, chlorination exhibited a strong correlation between ORP elevation (>400–450 mV) and treatment performance, while also providing a stable residual for post-treatment protection. The results demonstrate that ORP is a reliable monitoring indicator for chlorination but may underestimate the treatment efficiency of ozone-based oxidation processes.

Keywords: *Oxidation–Reduction Potential (ORP), Chlorination, Ozonation, Drinking water treatment, Escherichia coli, Surface water treatment, Sri Lanka.*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/040

Volume Reduction and Recycling Potential of Mechanically Crushed Glass Waste in Sri Lanka

D.M.K.G. Dissanayake*, H.D.S. Chamruk, W.A.D.S. Wijekoon

AMET Eco Solutions, Kurunegala, Sri Lanka

**Email Correspondence: kanchanadissanayake12@gmail.com*

Abstract

Glass waste, primarily generated from single-use food and beverage containers, poses a significant environmental challenge due to its non-biodegradable nature. In Sri Lanka, glass accounts for approximately 2% of municipal solid waste; however, sustainable management remains inadequate. Most waste glass accumulates as mixed waste and broken glass, creating challenges for recycling, as existing recycling facilities in Sri Lanka require properly sorted glass waste. This study investigates the mechanical crushing of unsorted waste glass bottles at 18,000 rpm to produce glass powder, thereby reducing storage volume and improving operational safety. Two crushing scenarios were evaluated in triplicate, and the average crushing time and volume reduction were determined. In the first scenario, five glass bottles with a total initial volume of 0.001 m^3 were crushed for 15 s. In the second scenario, a single glass bottle with an initial volume of 0.00075 m^3 was crushed for 22 s. The volume reduction observed for the first and second scenarios ranged from 0.0005–0.0006 m^3 and 0.000375–0.00045 m^3, respectively. In both cases, the volume was reduced by approximately 50–60%. The resulting glass powder has potential applications as a filling material in erosion control sandbags. Overall, mechanical crushing reduced the volume of waste glass by an average of 55%, thereby significantly enhancing storage efficiency and operational safety.

Keywords: *Glass Waste, Glass Powder, Mechanical Crushing, Volume Reduction, Unsorted*

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/058

Detection of Multidrug-Resistant *Pseudomonas aeruginosa* in Drinking Water Sources in the Western Province, Sri Lanka

Y.P. Thuduwage*, R.M.P.A. Bandara and S.S.S.de S. Jagoda

Centre for Aquatic Animal Disease Diagnosis and Research, Department of Veterinary Pathobiology, University of Peradeniya, Sri Lanka.

**Email Correspondence:yasasirinithuduwage@gmail.com*

Abstract

The global emergence of multidrug-resistant (MDR) bacterial pathogens has intensified public health concerns, particularly in settings where environmental reservoirs facilitate transmission. Pseudomonas aeruginosa is a Gram-negative opportunistic pathogen responsible for severe and recurrent infections, including chronic non-healing diabetic ulcers, cystic fibrosis–associated pulmonary infections, and hospital-acquired pneumonia. In developing countries, drinking water distribution systems represent a potential yet under-investigated environmental reservoir for MDR Pseudomonas spp. This study investigated the occurrence and antimicrobial resistance patterns of MDR Pseudomonas aeruginosa isolated from drinking water sources in the Western Province of Sri Lanka. Between February and September 2025, 38 water samples were collected from wells (n = 11), tap water (n = 15), and bottled water (n = 12). Samples were enriched and cultured on Glutamate Starch Phenol Red agar and Tryptic Soy Agar. Presumptive isolates were identified using Gram staining and biochemical characterization, followed by molecular confirmation through 16S rRNA gene PCR. Eighteen isolates (47.4%) were confirmed as Pseudomonas spp. Contamination rates were highest in well water (100%), followed by tap water (33.3%) and bottled water (16.7%). Antimicrobial susceptibility testing was performed using the Kirby–Bauer disk diffusion method against seven clinically relevant antibiotics. Resistance rates were as follows: ampicillin (100%), tetracycline (77.8%), ciprofloxacin (72.2%), ceftazidime (55.6%), gentamicin (50%), imipenem (44.4%), and aztreonam (38.9%). Twelve isolates (66.7%) met the criteria for multidrug resistance. Seven isolates (38.9%) demonstrated resistance to all tested antibiotics. Of these seven isolates, Sanger sequencing identified six as Pseudomonas aeruginosa and one as Pseudomonas putida. This study represents the first report of MDR Pseudomonas aeruginosa in drinking water sources in this region. The high prevalence of resistance highlights a significant environmental reservoir with serious implications for public health and water safety. Expanded surveillance and molecular characterization of virulence determinants and resistance genes are urgently warranted.

Keywords: *Pseudomonas aeruginosa*, Multidrug resistance, Drinking water contamination, Antimicrobial resistance, Public health

Knowledge to Actions for a Climate-Resilient Future
Annual Technical Sessions 2026/Circular Economy, Pollution Control & One Health/065

Pelletization of Biologically Treated Industrial Sludge for Sustainable Energy Production: Approach in Industrial Symbiosis

S.H.I.S. Gunasiri[1], A.H. Poornima[2], Asanka Welagedara[3], Udayagee Kumarasinghe[2*]

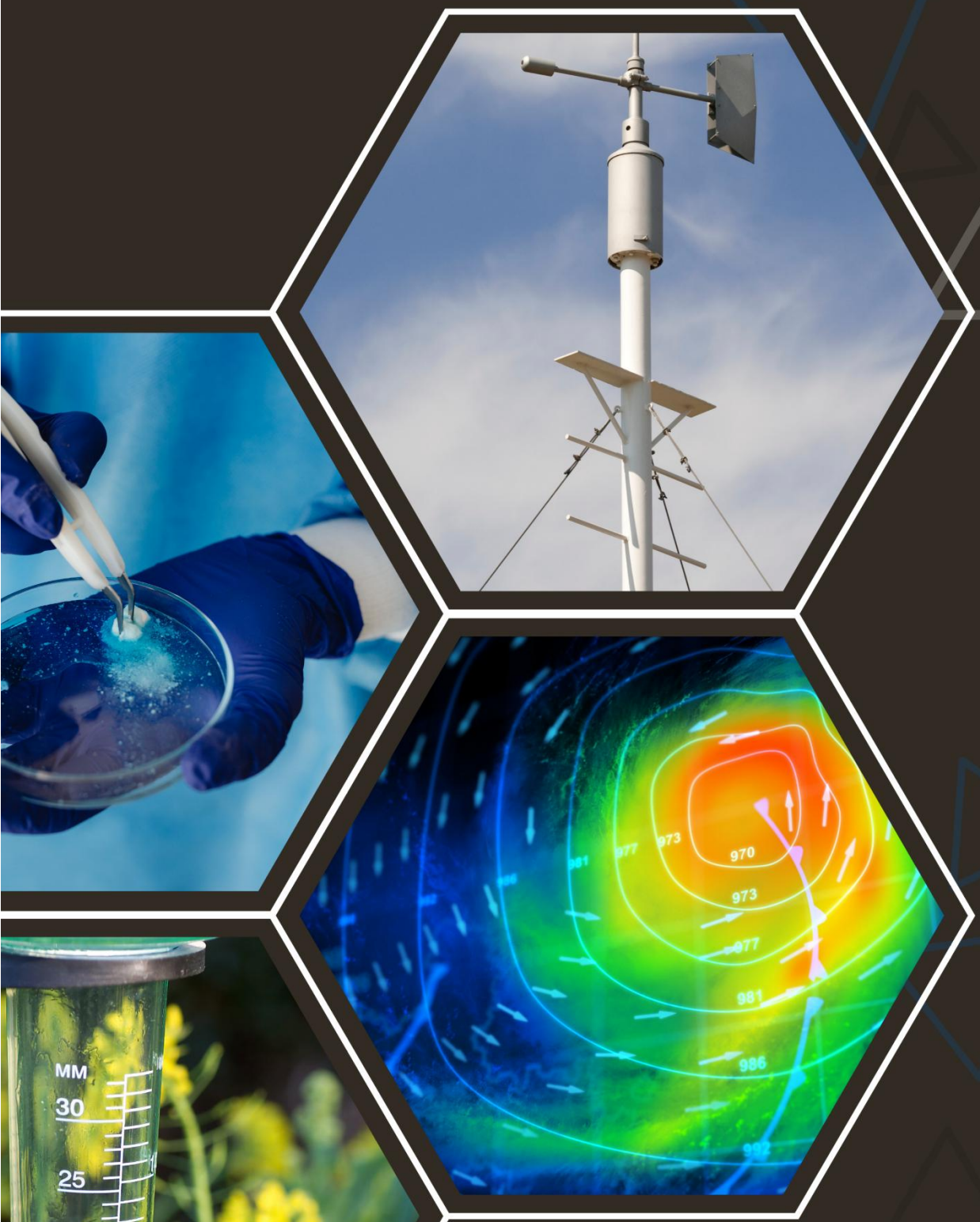
[1]*Faculty of Graduate Studies, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka.*
[2] *Department of Biosystems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama 10206, Sri Lanka*
[3]*Board of Investment of Sri Lanka, Level 24, West Tower, World Trade Centre, Colombo 01*

**Email Correspondence: *udayagee@sjp.ac.lk*

Abstract

Rapid industrialization has led to a substantial increase in the generation of industrial sewage sludge, creating significant environmental and economic challenges related to its disposal. In Sri Lanka, the Seethawaka Export Processing Zone (SEPZ) Common Wastewater Treatment Plant produces considerable quantities of biological sludge, necessitating sustainable management solutions. This study investigates the feasibility of enhancing the energy potential of biological sludge through pelletization with selected industrial waste materials, namely rubber waste and sawdust, to produce an alternative solid fuel. Sewage sludge, rubber waste, and sawdust were characterized for proximate properties, calorific value, and heavy metal content. Three pellet formulations were prepared using different weight ratios: sludge–rubber waste (1:1), sludge–sawdust (1:1), and sludge–sawdust–rubber waste (1:1:1). The produced pellets were evaluated for moisture content, ash content, volatile matter, and calorific value, and the results were compared with those of hard coal. The calorific value of the pelletized fuels ranged from 16.76 to 20.30 MJ/kg, while moisture content varied between 4.80 and 5.45%, depending on the mixture composition. Ash content ranged from 35.57 to 45.55%, and volatile matter content ranged from 49.82 to 60.75%. Among the tested formulations, the sludge–sawdust–rubber waste pellet (1:1:1 by weight) was identified as the most environmentally balanced option due to its relatively lower ash content and improved combustion characteristics.

Keywords: *Industrial sludge, Rubber waste, Sawdust, Sustainable energy*



Institute of Environmental Professionals Sri Lanka

'Parisara Piyasa', 104, Denzil Kobbekaduwa Mawatha,
Battaramulla, Sri Lanka
Tel: +94 11 308 42 68
Email: info@iepsl.lk

www.iepsl.lk

ISSN 3121-4118