

5th GLOBAL SUMMIT ON

ADVANCES IN EARTH SCIENCE AND CLIMATE CHANGE



SEPTEMBER 24-25

2026

VIRTUAL EVENT

SCIENTIFIC PROGRAM

DAY 01
THURSDAY

SEPTEMBER 24, 2026

BST - BRITISH SUMMER TIME

06:00-06:10	Inaugural Ceremony
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Topics: Earth Science | Climate Change | Soil Science | Green Energy | Recycling | Ecology | Geology | Pollution Control | Biodiversity | Remote Sensing | Hydrology | Atmospheric Chemistry | Natural Hazards | Oceanography | Sewage Treatment | Geoengineering

Distinguished Speaker Talks

06:10-06:30	Title: Minimizing Nutrient Leached Using Rain Shield Nutri Gard NPK Fertilizer Latifah Binti Omar, <i>Universiti Putra Malaysia Sarawak, Malaysia</i>
06:30-06:50	Title: Impact of Climate-Induced Adverse Weather on Autonomous Vehicle Perception: An AI-Based Enhancement Approach Aswini N, <i>PES University, India</i>
06:50-07:10	Title: Effect of Imposed Drought on Carbon Storage and Soil Respiration of Moso Bamboo Stand in Southeast China Benzhi Zhou, <i>Research Institute of Subtropical Forestry, Chinese Academy of Forestry, China</i>
07:10-07:30	Title: From Warning Signals to Early Action: Stress-Testing Anticipatory Governance in Landslide-Dammed Lake Risk Management Bih-Chuan Lin, <i>Da-Yeh University, Taiwan</i>
07:30-07:50	Title: AI-Driven Hydrodynamic Forecasting for Flood Early Warning in Climate-Sensitive Mahanadi River Network Monalisha Pattnaik, <i>Sambalpur University, India</i>
07:50-08:10	Title: Digital Collaboration Platforms for Climate Research Meeramani N, <i>JAIN (Deemed-to-be University), India</i>

08:10-08:30	Title: Tracing the Human–River Relationship in India through Case Studies across Historical Timelines Sharduli Joshi and Prajakta Chakravarty, <i>SMEF's Brick School of Architecture, India</i>
08:30-08:50	Title: Seismic Hazard Analysis in Complex Tectonic Settings: A Non-Traditional Perspective Niranjan Borah, <i>Barak Valley Engineering College, India</i>
08:50-09:10	Title: Disentangling Atmospheric and Soil Moisture Controls on Sap Flow in Forest Biomes Leena Khadke, <i>University of New South Wales, Australia</i> <i>Indian Institute of Technology Bombay, India</i>
09:10-09:30	Title: Business Standards for Digital Transformation in Financial Services Using Geo-Spatial Technology in Times of Climate Change Chinagudi Jayanna Jagadeesha, <i>Indian Space Research Organization ISRO-NRSC-RRSC-Bangalore, India</i>
09:30-09:50	Title: Emotional Contagion in Virtual Leadership: A Webcam-Based Study of Expressivity, Psychological Safety and Team Output Vidhu Gaur, <i>Management Development Institute (MDI), Gurgaon, India</i>
REFRESHMENT BREAK 09:50-10:00	
10:00-10:20	Title: The Unitive Science of a Living Universe Jude Currivan, <i>Co-founder WholeWorld-View, UK</i>
10:20-10:40	Title: Green FDI as a Catalyst for Climate-Resilient Development in Emerging Economies Sukanya R, <i>CHRIST University, India</i>
10:40-11:00	Title: Sustainable Consumers' Attitude & Perception towards Circular Economy of Bangladesh Regarding Ship Breaking and Recycling Products: Evidence from SEM Approach Meher Neger, <i>Comilla University, Bangladesh</i>

11:00-11:20	Title: Strategy for the Development of the Eastern Issyk-Kul Tourism Cluster under Mountainous Conditions Antonina Viktorovna Babosiuk, <i>M. Ryskulbekov Research University "Kyrgyz Economic University", Kyrgyz Republic</i>
11:20-11:40	Title: Root Absorption of CO₂ by Plants as an Ecosystem Factor in Regulating the Carbon Balance in the Biosphere Amiran Khabidovich Zanirov, <i>Kabardino-Balkarian State University named after H.M. Berbekov, Russia</i>
11:40-12:00	Title: Eco-Design and Renewable Energy as Drivers of Decarbonization in Energy-Intensive Industrial Systems Merve Balta, <i>Sakarya University, Turkey</i>
12:00-12:20	Title: Ecotourism in a Changing Climate: The Role of Sustainability Criteria and Indicators in Protected Areas in Türkiye (Case of Artvin-Camili Biosphere Reserve) İnci Zeynep YILMAZ, <i>Artvin Çoruh University, Türkiye</i>
12:20-12:40	Title: Soybean Mosaic Virus Infection in Three Cultivars of Soybeans Intercropped with Corn at Three Planting Densities of Soybeans Eman Ibrahim El-Sayed Abdel-Wahab, <i>Agricultural Research Center, Egypt</i>
12:40-13:00	Title: Factors Affecting Green Banking Technology Adoption in Bangladesh Naimul Islam, <i>University of Greenwich, UK</i>
LUNCH BREAK 13:00-13:30	
13:30-13:50	Title: Utilizing the Metaverse: Innovative Approaches for Improved Management and Organisational Effectiveness Ola Al Mari, <i>University of Seville, Spain</i>
13:50-14:10	Title: A Century-Old Coal Company: Hullera Vasco-Leonesa Leonardo Caruana de las Cagigas, <i>University of Granada, Spain</i>

14:10-14:30	Title: Beyond the Greenery: The Role of Urban Green Spaces in Supporting Climate Neutrality Carla Sofia Santos Ferreira, <i>Polytechnic University of Coimbra, Portugal</i>
14:30-14:50	Title: Carbon Capture, Sequestration and Carbon Credits As Strategic Tools for Climate Change Adaptation in the Niger Delta Oil Province of Nigeria Adewale Dosunmu, <i>University of Port Harcourt, Nigeria</i>
14:50-15:10	Title: Effect of Climate Change on Energy Security in Sub-Saharan Africa: The Role of Renewable Energy Adoption Lord-Freeman Dunyoh, <i>Jasikan College of Education / University of Professional Studies, Accra (UPSA), Ghana</i>
15:10-15:30	Title: Managing the Environmental Risks Related to the Effects of Climate Change on Urban Buildings through Innovative and Sustainable URM Infill Walls Associated to Quality Management and Use of Information Systems José Luís Miranda Dias, <i>National Laboratory of Civil Engineering (LNEC), Portugal</i>
15:30-15:50	Title: Co-Seismic Earthquake Lights (EQLs) during the 2023 Morocco Earthquake: Observations and an Atmospheric Friction Model Bendaoud Saâd, <i>Cadi Ayyad University, Morocco</i>
15:50-16:10	Title: E-Government, Governance and Sustainable Development: What Synergy for African Countries? Ahlam Er-Rahmani, <i>Ibn Tofail University, Morocco</i>
REFRESHMENT BREAK 16:10-16:20	
16:20-16:40	Title: Numerical Foundations for Computational Modeling in Wind Energy Andreia Aoyagui Nascimento, <i>Universidade Federal de Goiás, Brazil</i>

16:40-17:00	Title: Correlation of Space Weather with Biological Indicators – A Case Study: Myocardial Infarctions Luiz Felipe Rezende, <i>INPE - National Institute for Space Research, Brazil</i>
17:00-17:20	Title: Diagnosing Rebound Effects in Territorial Circular Economy Transitions: Implications for Climate Governance Rachida Bouhid, <i>Université du Québec à Montréal (UQAM), Canada</i>
17:20-17:40	Title: Similarity Analysis: Classification of Time Series Data Using Supervised and Unsupervised Learning David J Corliss, <i>Peace-Work, USA</i>
17:40-18:00	Title: Building Pathways to Sustainable Wastewater Management Systems in Developing Countries Using Semantic Network Models Fernando Ramos Quintana, <i>Tec de Monterrey, Mexico</i>
END OF DAY-1	

SCIENTIFIC PROGRAM

DAY 02

FRIDAY

SEPTEMBER 25, 2026

BST - BRITISH SUMMER TIME

06:15-06:30	Introduction
Topics: Earth Science Climate Change Soil Science Green Energy Recycling Ecology Geology Pollution Control Biodiversity Remote Sensing Hydrology Atmospheric Chemistry Natural Hazards Oceanography Sewage Treatment Geoen지니어ing	
Distinguished Speaker Talks	
06:30-06:50	Title: The Invasive Coconut Scale, <i>Aspidiotus rigidus</i> (Hemiptera: Diaspididae): A Continuing IPM Challenge in the Philippines Johana C. Orense, Philippine Coconut Authority (Retired), Philippines
06:50-07:10	Title: From Green Building Guidelines to Low-Carbon Design Decisions: An AHP-Based Prioritisation Framework for High-Rise Residential Buildings under LEED v5 Chih-Ju Lin, Da-Yeh University, Taiwan
07:10-07:30	Title: From Proximity to Ageing-in-Place: A Multi-Scale Evaluation of Age-Friendly Urban Environments Tran Le Khanh Thu, Da-Yeh University, Taiwan
07:30-07:50	Title: Ship-Generated Waste Management Practices, Challenges and Innovations On-Board and at Ports: A Systematic Review Abhijit Arvind Mohite, Indian Maritime University, India
07:50-08:10	Title: DripAlyze: Internet of Things Based Water Leakage Detection System for Smart Resource Management Maitri Patel, Institute of Advanced Research, India

08:10-08:30	Title: The Solar Activity and El Niño/La Niña Link: Effect on Surface Meteorological Elements Rajasri Sen Jaiswal, <i>Gopalan College of Engineering and Management, India</i>
08:30-08:50	Title: The Relevance of Sustainability in Education Riya Gupta, <i>AURO University, India</i>
08:50-09:10	Title: Beyond Connectivity: An Intelligent Emergency Communication for Localization and Evacuation in High-Altitude Disasters Barnali Dey, <i>Sikkim Manipal Institute of Technology, India</i>
09:10-09:30	Title : PFAS Pollution: A New Emerging Threat in Pakistan Its Environmental Distribution, Health Risks, and Advanced Remediation and Mitigation Strategies — A New Perspective Erum Bughio, <i>Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Pakistan</i>
09:30-09:50	Title: Exploring Oceanic Depths: Unveiling Hidden Treasures with IoT and Ensembled Deep Hybrid Learning Model Sujilatha Tada, <i>Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, India</i>
REFRESHMENT BREAK 09:50-10:00	
10:00-10:20	Title: What We Can Learn From India a Forerunner in Community Centric Forest Management: An Insight for Global Forest Policy and Governance Nick Lalrinmawia, <i>Mizoram University, India</i>
10:20-10:40	Title: Evaluation of Kinetic Models for Orange G Dye Removal Using Hydrodynamic Cavitation at Different Initial Dye Concentrations Amir Nasiri, <i>Amirkabir University of Technology (Tehran Polytechnic), Iran</i>
10:40-11:00	Title: Internet of Things-Driven Waste Management: Paving the Way for Sustainable Smart Cities Khadija Salim Al Yarubi, <i>University of Nizwa, Oman</i>

11:00-11:20	Title: What Are Our Duties to Mitigate the Climate Crisis? Mehmet Özçelik, <i>Van Yuzuncu Yil University, Turkey</i>
11:20-11:40	Title: Climate Change Addressing through Green Technology and Environmental Policy Instruments: An Economic Perspective and Implications for Recycling Burçin Çakır Gündoğdu, <i>Istanbul Gelisim University, Turkey</i>
11:40-12:00	Title: Biomass Waste Valorization Pathways for Sustainable Energy and Climate Action: Systematic Review Benjamin Yennuna Konyannik, <i>RUDN University, Russia</i> <i>Kwame Nkrumah University of Science and Technology, Ghana</i>
12:00-12:20	Title: The Ocean Wave 1449: Your Server Down Diallo Mohamed Bobo, <i>UFHB Cocody ICN Afrika 1449, Côte d'Ivoire</i>
12:20-12:40	Title: Effects of Geological Structures on Groundwater Geochemistry and Groundwater Flow within Deep Basement Aquifers of Lilongwe, Malawi Daniel Kilembe, <i>Mzuzu University, Malawi</i>
12:40-13:00	Title: Advances in Sustainable Pavement Subgrade Stabilization: A Review of Biopolymer- Natural Fiber Reinforcement of Clayey Soils Michael Chizobam Uwaezuoke, <i>University of Agriculture and Environmental Sciences, Nigeria</i>
LUNCH BREAK 13:00-13:30	
13:30-13:50	Title: The Stories of Ailing Forest Reserves and Standpoints of Agrarian Landowners: Kumbo and Lambo Reserves in Perspectives Yamboar Laarbik, <i>E. P. College of Education, Ghana</i>
13:50-14:10	Title : Who Must We Become? Climate Education, Identity and the Relational Turn Naida Culshaw, <i>Independent Scholar-Practitioner, UK</i>

14:10-14:30	Title: Valorization of Water Lettuce (<i>Pistia stratiotes</i> L.) Through Bioconversion for Black Soldier Fly Larvae (<i>Hermetia illucens</i>): Larvae Growth, Survival Rate and Nutritional Quality Farokh NIASS, <i>Gaston Berger University, Senegal</i>
14:30-14:50	Title: Using Inverse Seismology to Better Constrain High Impact, Low Probability (HILP) Seismic Hazard Estimates Carlos Sousa Oliveira, <i>Universidade Lisboa, Portugal</i>
14:50-15:10	Title: Providing the Grounds and Directions for a Randomized Controlled Trial Reducing Diagnosis Uncertainty in Psychiatric Symptomatology Related To Inhaled Pollutants – as Legitimized by the Precautionary Environmental Principle Ana Rodriguez, <i>Centre for the Studies of Population, Economy and Society, Portugal</i>
15:10-15:30	Title: Servitization as a Circular Economy Strategy for Climate Change Mitigation: Evidence from a Brazilian Packaging Company Heloisa Candia Hollnagel, <i>Pontifical Catholic University of São Paulo (PUC-SP) Universidade Federal de São Paulo (UNIFESP), Brazil</i>
15:30-15:50	Title: Shifting Mindsets: A Path for Change Acceleration Isabel Rimanoczy, <i>Convener PRME Working Group on the Sustainability Mindset, USA</i>
15:50-16:10	Title: Adoption of Blockchain Technology in Enhancing Supply Chain for Sustainable Practices: Case Study Review and Proposed Framework Shazia Hassan, <i>IEEE, USA</i>
16:10-16:30	Title: Improving Agricultural Resilience to Climate Change Communication Frameworks and Practices B. Roseline Bayili, <i>Laval University, Canada</i>

16:30-16:50	Title: Interannual Variability of Dinoflagellates in the Northern Humboldt Current System (NHCS) Maribel Baylón, <i>Universidad Nacional Mayor de San Marcos, Peru</i>
16:50-17:10	Title: Biomass Decomposition in Cacao-Based Agroforestry Systems Danny Daniela Guerrero Aguas, <i>Bajo Mira Cacao Company, Colombia</i>
17:10-17:30	Title: Assessing Shrubland Productivity in Arid Ecosystems Using Multivariate Ecological Indicators Martín Martínez-Salvador, <i>Autonomous University of Chihuahua, Mexico</i>
17:30-17:50	Title: Probabilistic Seismic Hazard Analysis for El Salvador Walter Mauricio Salazar Guerra, <i>Catholic University of El Salvador, El Salvador</i>
END OF DAY 2	

BOOKMARK YOUR DATES

6th GLOBAL SUMMIT ON

**ADVANCES IN EARTH SCIENCE
AND CLIMATE CHANGE**

September 2027 | Paris, France

DAY 01



VIRTUAL EVENT

5th GLOBAL SUMMIT ON

ADVANCES IN EARTH SCIENCE AND CLIMATE CHANGE

SEPTEMBER 24-25, 2026

SPEAKER TALKS



Minimizing Nutrient Leached Using Rain Shield Nutri Gard NPK Fertilizer

Latifah Omar^{1,2}, Mohd Hasyrin Hassan¹, Benny Ang³, Badrulisam Jantan⁴ and Mohamad Norrizam Bin Abu Hassan⁴

¹Faculty of Agricultural Sciences and Forestry, Universiti Putra Malaysia Sarawak, Malaysia

²Department of Land Management, Faculty of Agriculture, UDRP-Regenerative Agriculture for Sustainable Crop Productivity, Universiti Putra Malaysia, Malaysia

³Hextar Industries Berhad, Malaysia

⁴Macrotech Solutions Sdn. Bhd., Malaysia

Many fertilizers currently available in the market are not necessarily efficient in enhancing the growth and development of oil palm seedlings. A nano biopolymer-coated NPK fertilizer, known as Nutrigard NPK, has been introduced to improve nutrient efficiency and promote vigorous oil palm seedling growth at the main nursery stage. This study was conducted to evaluate the growth performance of oil palm seedlings following the application of Nutrigard NPK at full (GF) and 30% reduced (GQ) dosages, in comparison with slow-release fertilizer (AB) and conventional NPK fertilizers, both imported (CI) and local (CL). The fertilizers (GF, GQ, CI, and CL) were applied fortnightly after transplanting and subsequently once monthly from 22 weeks after transplanting, while the slow-release fertilizer (AB) was applied only twice, at 2 and 22 weeks after transplanting. At 43 weeks after planting, Nutrigard NPK applied at a 30% reduced dosage (GQ) consistently enhanced oil palm seedling growth attributes despite receiving a lower fertilizer dosage (7 g per palm) compared to 10 g per palm in GF, CI, and CL, and 75 g per palm in AB. Total nitrogen (N), phosphorus (P), and potassium (K) uptake concentration in the seedling tissues were higher in palms fertilized with Nutrigard NPK (GF and GQ) compared to those receiving conventional fertilizers (CI and CL), indicating more efficient nutrient uptake and utilization. The controlled nutrient release in GQ can be attributed to its nano-biopolymer coating, which protects nutrients from rapid leaching, ensures gradual release, enhances root uptake, and minimizes nutrient losses to the environment, thereby reducing risks of soil and water contamination. Overall, Nutrigard NPK particularly at the reduced dosage (GQ) represents a sustainable, nutrient-efficient, and environmentally friendly fertilizer option for improving oil palm nursery management.

Presenter:

Latifah Binti Omar

Universiti Putra Malaysia Sarawak, Malaysia



Impact of Climate-Induced Adverse Weather on Autonomous Vehicle Perception: An AI-Based Enhancement Approach

Aswini N

PES University, India

Autonomous vehicles rely heavily on vision-based perception systems for safe and reliable navigation. However, their performance degrades significantly under adverse weather conditions such as fog, rain, low-light environments, and snow conditions that are becoming increasingly severe due to climate change. This talk investigates the impact of such climate-induced environmental variability on image-based perception in autonomous driving systems.

The study focuses on improving visual data quality using a combination of classical and AI-supported image enhancement techniques. A hybrid pre-processing pipeline integrating Contrast Limited Adaptive Histogram Equalization (CLAHE) and bilateral filtering is employed to enhance degraded road-scene images captured under challenging environmental conditions. The experiments are carried out using the Indian Driving Dataset (IDD), which provides diverse and realistic driving scenarios representative of complex Indian traffic and road conditions.

The enhanced images are further evaluated for downstream perception tasks, particularly object detection using deep learning models such as YOLOv7, YOLOv11, and RT-DETR. Experimental analysis demonstrates that the proposed enhancement framework improves image quality metrics including Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM), resulting in more reliable and accurate detection performance under degraded visibility conditions.

The findings highlight the importance of robust perception pipelines in ensuring the safety and reliability of autonomous vehicles operating in dynamic and climate-affected environments. This work contributes to the broader domain of AI in climate research by addressing the intersection of environmental variability and intelligent transportation systems, while offering scalable solutions to mitigate weather-induced perception challenges.

Presenter:

Aswini N

PES University, India



Effect of Imposed Drought on Carbon Storage and Soil Respiration of Moso Bamboo Stand in Southeast China

Benzhi Zhou

Research Institute of Subtropical Forestry, Chinese Academy of Forestry, China

Drought can severely affects alteration of carbon sink-source relationships through impacts on carbon storage and carbon emission in forest ecosystems. On-site field experiment is very rare on drought effect on forest carbon cycle, especially in subtropical forest ecosystems. In this study, we imposed drought to a moso bamboo stand by excluding throughfall to the forest floor beginning in July 2012, and measured biomass carbon, soil carbon, and soil respiration during specific period over the drought duration. Bamboo shoot number, new culm number, and their height and diameter at breast height were significantly lower in throughfall exclusion (TE) plots than in control (CK) plots, with decrease of 64.6, 70.8, 10.6 and 11.3%, respectively. Annual carbon sequestration for TE plots was 58.1% lower than that for CK plots. Soil carbon storage in the 0–60-cm layer in CK and TE plots decreased by 3.7 and 12.2%, respectively, during the 10-month experiment period. Drought led to ~10% decrease for ecosystem carbon storage in moso bamboo stand. On the other hands, drought caused a significant decline (~25%) in annual soil respiration rate and CO₂ emission (~26%), with the significant difference occurring in growing seasons. Drought does not change the exponential relationship between soil respiration and temperature, but decreases the temperature sensitivity, and the correlation coefficient between soil respiration and temperature/moisture. Our findings should provide a better understanding of carbon sequestration potential and determination of how future climate change may impact carbon budgets.

Presenter:

Benzhi Zhou

Research Institute of Subtropical Forestry, Chinese Academy of Forestry, China



From Warning Signals to Early Action: Stress-Testing Anticipatory Governance in Landslide-Dammed Lake Risk Management

Bih-Chuan Lin

Assistant Professor, Graduate School of Architecture
Da-Yeh University, Taiwan

As climate-related extreme rainfall and mass-movement processes increase the likelihood of compound mountain hazards, landslide-dammed lakes present a governance challenge that is temporal as much as technical. They may remain apparently contained while hydrological, geomorphological, and downstream exposure conditions continue to evolve. This study interprets the Matai'an Creek landslide-dammed lake in eastern Taiwan as a near-miss policy stress test and asks whether recognized warning signals were translated into early protective action before failure occurred. The analysis develops a transferable signal-to-action diagnostic that links governance timing, escalation thresholds, and operational intervention. It combines documentary process tracing, case-policy implementation mapping, temporal segmentation into four phases, conservative reclassification of 97 activated disaster risk reduction actions, and an Escalation Index to compare intervention depth across time. The results show a clear pre/post contrast. Before collapse, governance activity was present but dominated by monitoring, assessment, coordination, and advisory communication, with EI values remaining in the procedural range ($T1 = 1.36$; $T2 = 1.61$). Stronger structural mitigation and trigger-based interventions became prominent mainly during and after the collapse phase ($T3 = 3.38$; $T4 = 3.42$). The findings suggest that the critical governance weakness was not simply a lack of risk information, but delayed escalation from recognized signals to operational protective action. The study contributes a transferable framework for interpreting near-miss periods as policy stress tests, making governance latency visible and informing anticipatory disaster risk reduction systems that connect monitoring outputs to predefined thresholds, responsibilities, and early-action protocols.

Presenter:

Bih-Chuan Lin

Da-Yeh University, Taiwan



AI-Driven Hydrodynamic Forecasting for Flood Early Warning in Climate-Sensitive Mahanadi River Network

Monalisha Pattnaik¹, G Mariam Rao², Deepti Rani Pattnaik¹, Laxmi Priya Panda², Ratan Kumar Behera², Umrah Naushad², Soni Dubey², Alka Kujur¹, Priyambada Mohapatra¹ and Chandra Sekhar Jana¹

¹Department of Statistics, Sambalpur University, India

²Department of Business Administration, Sambalpur University, India

The Mahanadi River Basin in eastern India is one of the most flood-prone and climatically sensitive regions due to intense monsoonal rainfall, cyclonic activity, and regulated flows from the Hirakud reservoir. Frequent extreme hydrological events necessitate accurate and reliable forecasting of key hydrodynamic variables such as rainfall (gauge), water level, and discharge to support timely flood management and early warning systems.

Objective: The primary objective of this study is to develop and evaluate robust data-driven and hybrid modeling frameworks capable of accurately forecasting hydrodynamic variables and flood conditions in the Mahanadi River Basin, particularly under non-linear, non-Gaussian, and non-stationary data characteristics.

Scope: Using 42–43 years of daily hydrodynamic data (1978–2020) from up to 17 rain gauge stations, the study focuses on identifying effective gauge networks through PCA and cluster analysis and developing predictive models for selected key stations of middle and lower Mahanadi river basin (Bamnidhi, Basantpur, Kesinga, Kantamal, Tikarpara, Salebhata, Mahendrapur, Rampur, Sundargarh, Baroda, Rajim, and Kurubhata). The work addresses scenarios of incomplete data availability and emphasizes downstream flood prediction.

Methods Used: A comprehensive modeling framework is employed, including conventional statistical models (ARIMA, ETS), machine learning models (ANN, regression, decision tree, DNN), hybrid models (ARIMA-ARNN), advanced deep learning models (LSTM, GRU, RNN), and federated learning architectures (FDNN, FLSTM). Cluster analysis (K-means, PAM, Hierarchical Clustering) and PCA are used to design effective rain gauge networks. Model performance is evaluated using RMSE and MAE, with both in-sample and out-of-sample (30-day ahead) forecasting.

Results: Results demonstrate that conventional and hybrid statistical models are insufficient to fully capture the inherent non-linearity, non-stationarity, and white-noise characteristics of hydrodynamic time series. Deep learning

models, particularly LSTM and Federated LSTM, significantly outperform other approaches across all key stations. Decision-tree analysis reveals that data from strategically located stations (e.g., Basantpur, Tikarpara, Kantamal) are sufficient for reliable flood prediction, even in the absence of data from other gauges. Federated models further enhance accuracy while preserving data privacy and reducing communication constraints.

Conclusion: The study concludes that advanced deep learning and federated-based models provide a highly accurate, robust, and scalable solution for flood forecasting and hydrodynamic prediction in the Mahanadi River Basin. These models offer strong potential as early warning tools for policy-makers and disaster management authorities, enabling improved flood preparedness, efficient water resource management, and resilience against climate-induced hydrological extremes.

Presenter:

Monalisha Pattnaik

Sambalpur University, India



Digital Collaboration Platforms for Climate Research

Meeramani N

JAIN (Deemed-to-be University), India

Climate change research is becoming more dependent on interdisciplinary and geographically distributed collaboration because of the nature of the challenges associated with climate change, scale and complexity. Digital collaboration platforms have emerged as vital infrastructures that facilitates adequate coordination, data sharing, collaborative analysis, and transparent dissemination of climate and earth science research outputs. This paper discusses how digital collaboration tools can contribute to climate research, especially the with particular emphasis on the research support services and role of an academic institutions.

Objectives: The primary objective of this study is to analyze how digital collaboration platforms enhance interdisciplinary climate research and to discussing the role of academic libraries in supporting these platforms through research data management (RDM) and open science practices.

Scope: The study emphases on digital collaboration platforms used in climate and earth science research, such as data repositories, virtual research environments, and collaborative writing tools, particularly research ecosystems supported by libraries.

Methods: The paper adopts a qualitative, descriptive research design which relied on a comprehensive study of scholarly literature, policy and best-practices associated with digital collaboration, climate research, and academic library services. The data obtained was thematically analyzed to determine the key trends, advantages, and challenges.

Results: The findings show that digital collaboration platforms have a strong positive impact on the research output, interdisciplinary knowledge sharing, data transparency, and reproducibility in climate research. Libraries play a key role by integrating collaboration platforms with RDM services, institutional repositories, and FAIR data principles.

Conclusion: The study concludes that digital collaboration platforms, are vital for the development of successful, transparent, and sustainable climate research. Enhancing the library-led collaboration infrastructures will improve

global climate research and provide evidence-based responses to climate change.

Presenter:

Meeramani N

JAIN (Deemed-to-be University), India



Tracing the Human–River Relationship in India through Case Studies across Historical Timelines

Sharduli Joshi and **Prajakta Chakravarty**

SMEF's Brick School of Architecture, India



This paper investigates the evolving human–river relationship in India, examining how societal attitudes have shifted from deep cultural reverence to growing ecological responsibility. Indian rivers, deeply embedded in the nation's religious, cultural, and ecological fabric, have historically dictated settlement patterns and defined civilizational identity. By analyzing the transformations in these roles across various historical periods, this study presents India as a significant model for understanding global human–water interactions, particularly how venerated natural entities have become focal points of environmental concern.

The study strategically examines four major riverine basins in India, each selected for its unique geographic, ecological, and cultural importance, to offer a comprehensive representation of the nation's hydrological diversity. Adopting a rigorous case study approach, the research investigates the evolving functions of these river systems by integrating qualitative analyses drawing from cultural narratives, religious texts, and observations of local practices with quantitative data, including detailed pollution metrics and precise water usage statistics. This robust interdisciplinary methodology facilitates a deep, multifaceted understanding of the intricate, historical relationship between humans and rivers across time.

The findings reveal critical historical junctures that have led to the ecological decline of these once-sacred rivers, specifically citing urbanization, industrialization, and governmental policy inadequacies as primary drivers. However, the research also identifies promising, emergent initiatives ranging from grassroots community actions to institutional reforms that suggest a potential transition toward more sustainable and ecologically sensitive river management. By considering India's rivers not merely as cultural symbols but as vital, stressed ecological systems, this paper advocates for the adoption of integrated, historically contextualized frameworks in water resource management. A thorough understanding of the historical trajectory of these human–river interactions is essential for charting a course toward a more sustainable and balanced future, ensuring the preservation of these critical natural resources.

Presenter:

Sharduli Joshi, SMEF's Brick School of Architecture, India

Prajakta Chakravarty, SMEF's Brick School of Architecture, India



Seismic Hazard Analysis in Complex Tectonic Settings: A Non-Traditional Perspective

Niranjana Borah

Barak Valley Engineering College, India

Seismic Hazard Analysis (SHA) is a crucial component of disaster risk management. In regions prone to high seismic activity, SHA can provide key inputs for disaster risk mitigation. However, SHA in tectonically active areas needs methods that can capture the complicated spatial and temporal patterns of seismicity. Classical SHA methods as we know, depends heavily on historical earthquake (EQ) catalogs, idealized fault models, and empirical ground-motion prediction equations. These methods have well-known problems. These methods sometimes make hazard levels seem lower or simpler than they really are in areas with limited seismic records, diffuse seismicity, or poorly delineated fault systems. In this situation, the Non-traditional methods like grid-based source modeling along with Kernel density offer a more adaptable and data-responsive framework. Grid-based source modeling based on available EQ data, spreads seismic potential throughout a mesh. Thus, it doesn't completely rely on preset rigid source boundaries. Similarly, Kernel Density Estimation (KDE) method improves this method by smoothing out seismicity rates and finding clustering patterns hidden in the data. This makes it possible to show regional seismic behavior in a more continuous way. Besides, as a new approach, Synthetic ground-motions also can be used taking into account the specific source-to-site features and the local geology. This gives better understanding of the ground motion properties for scenario EQs when recorded ground motions are not adequately available. Using these new methods in seismically active areas of the Himalayas, like Sikkim in Northeast India, illustrate their useful in modern SHA. Besides, topographic Vs30 data can help with site-class evaluation, which is then followed by site response analysis to figure out how much shaking there will be at the surface for certain return periods. These non-traditional methodologies show that the risk of hazards varies greatly from place to place which was not been able to detect by traditional SHA methods. Modern data-driven and physics-based techniques provide more realistic predictions of ground shaking and overcome the limitations of conventional SHA. This makes the estimation of hazard level better for developing robust infrastructure, thus reducing seismic risk, and making a proper policy in areas that are at risk.

Presenter:

Niranjana Borah, Barak Valley Engineering College, India



Disentangling Atmospheric and Soil Moisture Controls on Sap Flow in Forest Biomes

Leena Khadke^{1,4}, Akash Verma^{2,4}, Sandipan Mukherjee³ and Subimal Ghosh^{4,5}

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²Department of Life Sciences, Imperial College London, UK

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⁴Department of Civil Engineering, Indian Institute of Technology Bombay, India

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Sap flow is a critical indicator of plant water use and provides key insights into vegetation responses to environmental stressors such as drought and climate change. However, the causal relationships between sap flow variability and environmental drivers remain insufficiently characterized, particularly regarding instantaneous and memory effects within the soil–plant–atmosphere continuum. This study aims to identify the dominant environmental controls on sap flow dynamics and to quantify their temporal interactions. Using global observations from the SAPFLUXNET database, we analyzed sap flow variability in evergreen broadleaf forests (EBF), evergreen needleleaf forests (ENF), and mixed forests (MF). We applied an information theory–based process network analysis to infer causal drivers of sap flow, complemented by wavelet analysis to resolve interactions across multiple temporal scales. Our results show that vapor pressure deficit (VPD) and soil water content (SWC) jointly regulate sap flow across all forest types, with VPD consistently emerging as the dominant causal driver. This highlights the central role of atmospheric demand in controlling plant water use. Wavelet analysis further reveals scale-dependent interactions, with VPD exerting strong and immediate effects on sap flow, while SWC influences sap flow predominantly at delayed timescales, reflecting soil moisture memory effects. These findings advance our mechanistic understanding of plant–water relations and land–atmosphere feedbacks and provide empirical evidence essential for improving land surface models and predicting ecosystem responses under future climate change scenarios.

Presenter:

Leena Khadke

University of New South Wales, Australia

Indian Institute of Technology Bombay, India



Business Standards for Digital Transformation in Financial Services Using Geo-Spatial Technology in Times of Climate Change

C J Jagadeesha

Indian Space Research Organization ISRO-NRSC-RRSC-
Bangalore, India

Climate resilience is to be built in the geographical regions by appropriately understanding Climate Change and the role of entire gamut of greenhouse gases. Climate change adaptation technologies for a sustainable infrastructure in managing natural resources, industries and services should be made mandatory. This should consider using Geo-spatial technologies while digital transfer is happening in most of the countries. Satellite data derived agriculture areas, water bodies, forest, shrub-land and developed industrial areas are used in assessing GHG emissions and also carbon sequestration in Tungabhadra-basin, India. Also Landsat and IRS satellite data derived cropping systems in various seasons are used by me for calculating agricultural water footprints and an increase of 2°C rise scenario resulted in more need of water and storage control and soil moisture, evapo-transpiration control are suggested for future.

Bad environment can never be good economics. Increased environmental pollution and natural resources use for people and infrastructure demands are to be assessed in a top down holistic approach using sustainability, circular economy and the level of digital transfer concepts adopted for a country as a whole. Sustainability indexed Industries need to be financed considering BPMN (business process_ management_ notation diagrams) and with production assessment using social accounting matrices of the neighborhood. Governance strategy should be from whole to parts. Belemy framework of climate change adaptation indicators including assessing the geology, geomorphology, river systems, ecosystems sustainability considerations are to be done using satellite data. Digitisation, digitalisation and digital transfer are to be planned for all sectors simultaneously, adopting 7Rs of organizational dynamics for better governance of finances and economy. The AI based digital public infrastructure should be created and handled with appropriate climate resilient macroeconomic indicators like climate risk indexed insurance, GDP, transition risks, labour force stability. Satellite earth observation with MODIS and DMS-OLP night light sensor data can map spatial patterns of both market and non-market indicators.

Presenter:

Chinagudi Jayanna Jagadeesha

Indian Space Research Organization ISRO-NRSC-RRSC-Bangalore, India



Emotional Contagion in Virtual Leadership: A Webcam-Based Study of Expressivity, Psychological Safety and Team Output

Vidhu Gaur

Management Development Institute (MDI), Gurgaon, India

Objectives: Drawing on emotional contagion, psychological safety, emotional intelligence, and e-leadership theories, this study examines how leaders' webcam-based expressivity influences emotional dynamics and team performance in virtual settings. It specifically investigates whether emotional contagion and psychological safety mediate this relationship and how emotional intelligence and camera-on culture moderate these effects within the Indian context.

Methods: A sequential mixed-methods design was employed. The quantitative phase involved a three-wave time-lagged survey of 400 professionals from IT, finance, and consulting sectors in India. Validated scales (WLEIS, Emotional Contagion Scale, Edmondson's Psychological Safety Scale) were analysed using Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM), along with bootstrapping, moderation analysis, and random forest regression. The qualitative phase included behavioural observations of 20 virtual team meetings, systematically coded for leader expressivity and team responses.

Results: Leader expressivity significantly predicted emotional contagion ($\beta = 0.49$), which in turn enhanced psychological safety ($\beta = 0.54$) and team output ($\beta = 0.61$). Psychological safety mediated the relationship between emotional contagion and performance outcomes. Emotional intelligence ($\beta = 0.21$) and camera-on culture ($\beta = 0.18$) strengthened these relationships. Observational findings corroborated the quantitative results, showing that expressive leaders generated higher engagement and emotional alignment among team members.

Conclusions: The study extends emotional contagion and leadership theories into digitally mediated environments, establishing webcam expressivity as a critical mechanism of virtual leadership. It demonstrates that emotional influence can be effectively transmitted through video interfaces, particularly when supported by high emotional intelligence and visual engagement norms. Practically, the findings position leader expressivity as a measurable and developable capability for enhancing psychological safety and team effectiveness in remote work contexts.

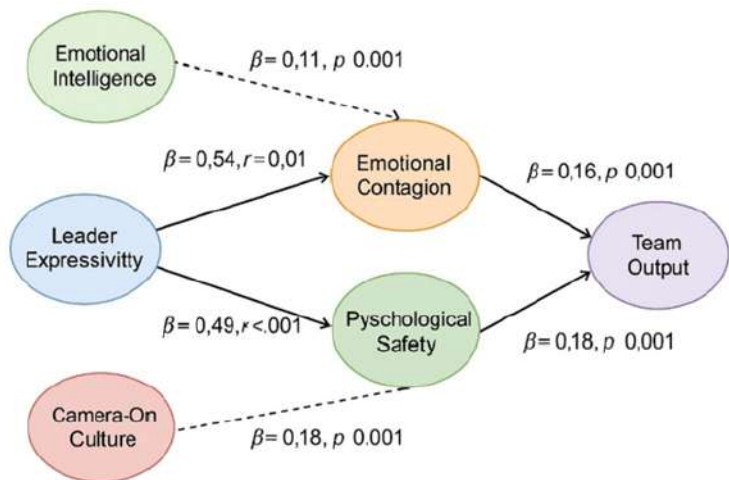


Fig: Structural path model and hypothesis testing results

Hypothesis	Pathway	Estimate (β)	SE	p-value	Supported
H1	Leader Expressivity → Emotional Contagion	0.49	0.06	<0.001	Yes
H2	Emotional Contagion → Psychological Safety	0.54	0.05	<0.001	Yes
H3	Psychological Safety → Team Output	0.61	0.04	<0.001	Yes
H3a	Indirect Effect (via EC and PS)	0.16	—	<0.001	Yes

Presenter:

Vidhu Gaur
Management Development Institute (MDI), Gurgaon, India



The Unitive Science of a Living Universe

Jude Currivan

Co-founder WholeWorld-View, UK

In 2024, the launch of the International Decade of Sciences for Sustainable Development (IDSSD) initiative, with UNESCO as the lead agency, aims to 'promote global collaboration through sciences to achieve a sustainable future'. It recognises science as 'a common good for humanity and reaffirms its fundamental role in humanity's quest for a development model that improves the human condition while preserving the planet on which our very survival depends'.

Yet while its technological progress has brought substantial benefits, the worldview on which modern science has stood since the late nineteenth century has also come at a high cost. This worldview has tended to frame reality as a material and mechanistic system made up of separate objects, largely stripped of inherent meaning or purpose. Such assumptions helped underpin the Industrial Revolution and extractivist and exploitative economics models that followed, many of which continue to drive its now catastrophic trajectory and proving to be socially and ecologically unsustainable.

This worldview has effectively dis-membered our collective psyche, giving rise to what I refer to as a dis-ease of separation in how we relate to each other and the natural world. To truly confront the existential threats we face, we must do more than manage the symptoms of its pathology; we must heal our foundational rupture.

My presentation is based on an evidence-based discussion paper I was invited to write in March 2026 by the Club of Rome entitled *The Unitive Science of a Living Universe*

In referencing its unitive framework, the Club notes that:

An evidence-based unitive perspective, one that recognises our mutual interdependence with one another and our planetary home, is essential to underpin and frame collective efforts. It enables an evolutionary perspective grounded in a cosmological and planetary context and affirms our emergent potential. In doing so, rather than perpetuating conflicts that continue to play out the illusion of separation, it can cultivate respect for pluriversality and support the embodiment of post-hegemonic values and ethical behaviours that are equitable, inclusive and rooted in experiential kinship and reverence for all life.

Its unitive vision and narrative converge with ancient wisdom teachings and indigenous traditions, re-imbuing our Universe with innate meaning and purpose and ourselves in mind, body and spirit, inseparable from its planetary and universal Web of Life.

The discussion paper and this presentation invite further exploration, dialogue, investigation and testing of such a unitive perspective based on evidence at all scales of existence and across numerous fields of research, together with proposed and interpretative theoretical framings. In offering a unitive cosmological and planetary underpinning and context, its discussion aims to further enable and empower efforts regarding human and planetary well-being.

Presenter:

Jude Currivan

Co-founder WholeWorld-View, UK



Green FDI as a Catalyst for Climate-Resilient Development in Emerging Economies

Sukanya R

Department of Commerce, CHRIST University, India

The accelerating pace of climate change has positioned emerging economies at the forefront of the global sustainability transition, inducing the role of green FDI increasingly important in shaping climate-resilient development pathways. Green FDI, defined as cross-border investment directly contributing to environmental sustainability, is no longer limited to renewable energy projects and now spans diverse sectors, including climate-smart agriculture, circular economy industries, green mobility, waste-to-resource technologies, and low-carbon manufacturing.

In this context, the present paper examines how Green FDI serves as a strategic catalyst in helping emerging economies decarbonize their growth, modernize industrial systems, and enhance their adaptive capacity against climate risks. Drawing from UNCTAD's World Investment Report, World Bank climate finance datasets, and sector-specific case studies from India, Brazil, Indonesia, and South Africa, the discussion highlights how inflows of green capital accelerate technology transfer, enhance institutional learning, build green infrastructure, and generate employment in high-skill sustainability sectors. At the same time, the paper demonstrates how policy frameworks—such as green industrial policies, carbon pricing, ESG-based investment screening, and climate-aligned trade agreements—are reshaping investor behavior and reallocating financial flows toward low-emission and resource-efficient business models.

While Green FDI offers wide-ranging economic and environmental benefits, its diffusion remains skewed due to structural constraints, like regulatory uncertainty, climate financing gaps, institutional capacity deficits, and persistent North–South asymmetries in green technology ownership. The paper asserts that unlocking the full potential of Green FDI requires a coordinated strategy built on blended finance, sovereign green bonds, de-risking instruments, green investment treaties, and climate-smart special economic zones. By positioning Green FDI as a bridge between growth and sustainability, the paper proposes a forward-looking framework that supports the achievement of SDG 7 (Affordable & Clean Energy), SDG 9 (Industry, Innovation & Infrastructure), SDG 13 (Climate Action), and SDG 17 (Global Partnerships), while redefining investment not just as capital flow, but as a mechanism for climate justice, resilience building, and sustainable global value chain restructuring.

Presenter:

Sukanya R

CHRIST University, India



Sustainable Consumers' Attitude & Perception towards Circular Economy of Bangladesh Regarding Ship Breaking and Recycling Products: Evidence from SEM Approach

Meher Neger

Head of the Department, Department of Marketing, Comilla University, Bangladesh

The study investigates those determinants which impact on consumers' attitude and perception towards circular economy regarding ship breaking and recycling products in Bangladesh. The purpose of the research was to investigate consumers' attitude and perception towards ship breaking and recycling products in the content of Bangladeshi consumers. A standardized questionnaire was used to collect 215 data from Bangladeshi consumers of different areas, residents in a few geographical locations like Chattogram, Cumilla, Dhaka and Mymensingh using purposive sampling method. A partial least square structured equation modelling (PLS- SEM) approach was used to evaluate the data and test the hypotheses. The Descriptive research design has been used for this study. There is total 215 respondents. Total 16 items have been considered and given to the respondent to respond according to independent and dependent variables. SPSS version 25 and Smart PLS had used to conduct statistical analysis. The findings indicate that the recycling attitude and perception towards plastic waste significantly influenced by Perceived Behavioural Control and Subjective Norms. The maximum respondents in this investigation are students. In this study the sample have considered maximum from the urban area. Side by side there are only 215 sample size. Diversify the sample population, increase sample size, adopt a mixed methods approach, and consider cultural and contextual factors. The study provides support to the authorities conduct their ship breaking and recycling business by considering the consumers' attitude and perception determinants and help them to make proper consumer market. This study also could provide new insights about how competitive advantages could be improved by examining the affective determinants development impacts at the perspective of Bangladeshi consumers.

Presenter:

Meher Neger

Comilla University, Bangladesh



Strategy for the Development of the Eastern Issyk-Kul Tourism Cluster under Mountainous Conditions

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¹PhD in Economics, Doctoral Candidate, M. Ryskulbekov Research University "Kyrgyz Economic University", Kyrgyz Republic

²Doctor of Geographical Sciences, Professor, Rector, Kyrgyz National University named after Jusup Balasagyn, Kyrgyz Republic

³Doctor of Economics, Professor, Chief Research Fellow, Research Institute of Economics, M. Ryskulbekov Research University "Kyrgyz Economic University", Kyrgyz Republic

Objective: The study aims to provide a scientific, theoretical, and methodological foundation, as well as practical recommendations, for the establishment and development of a regional tourism cluster under mountainous conditions.

Research Field: Environmental and Natural Resource Economics.

Methods: The research methodology integrates three complementary approaches: economic-statistical analysis, monographic research, and comparative analysis.

Results and Conclusions: The proposed Eastern Issyk-Kul Tourism Cluster covers an area of approximately 26.5 thousand km². Its elevation ranges from 1,600 m above sea level (Lake Issyk-Kul) to 7,439 m at the summit of Jengish Chokusu (Victory Peak). The region borders Kazakhstan and China and represents one of Central Asia's most significant high-mountain areas. It includes the glaciated massifs of Khan Tengri (6,995 m) and Jengish Chokusu, as well as the country's largest glacier, South Inylchek Glacier, extending approximately 60 km. The region is also home to Issyk-Kul, measuring 182 × 60 km with a maximum depth of 668 m, making it the world's second-largest high-altitude lake after Lake Titicaca.

The implementation of the Eastern Issyk-Kul Tourism Cluster is planned in two phases, with forecast indicators established for the subsequent five-year period. According to the first-stage projections (2027–2031), the number of tourists visiting the cluster is expected to increase by 240.4 thousand, generating approximately KGS 423 million in additional tourism revenue.

The study proposes a six-stage conceptual framework for tourism cluster development, encompassing resource potential assessment, strategic planning, institutional integration, infrastructure development, cluster management, and the establishment of an organizational and economic mechanism. The successful implementation of this framework in the Issyk-Kul region requires flexible forms of cooperation based on cluster strategies, which can simultaneously enhance tourism competitiveness and contribute to balanced regional socio-economic development.

This objective will be achieved through effective stakeholder cooperation, clear functional specialization within the cluster, and a market-oriented development strategy tailored to the needs of priority target segments. Furthermore, the cluster model will promote sustainable and balanced socio-economic development across the Eastern Issyk-Kul region of the Kyrgyz Republic.

Presenter:

Antonina Viktorovna Babosiuk

M. Ryskulbekov Research University "Kyrgyz Economic University", Kyrgyz Republic



Root Absorption of CO₂ by Plants as an Ecosystem Factor in Regulating the Carbon Balance in the Biosphere

Amiran Zanirov and **Zalim Dudarov**

Kabardino-Balkarian State University named after H.M. Berbekov, Russia

Underestimating the role of root carbon dioxide uptake by plants as an important factor in regulating the carbon balance in an ecosystem is fraught with the development of unreliable guidelines for managing this very balance. A number of experimental studies conducted in the laboratory of the Center for Decarbonization of Agriculture and Regional Economics of KBSU established a significant contribution of root carbon nutrition to plant growth. So, over 23% of the biomass of model plants was formed due to carbon entering through the roots. It was also found that the regulation of this mechanism is influenced by light intensity, CO₂ concentration in the atmosphere and nitrogen nutrition. A specially designed author's device was used for a differentiated analysis of the processes occurring in the root and leaf zones of plants isolated from each other. It was found that in the "night" mode, the concentration of carbon dioxide in the root chamber with a volume of 0.022 m³ decreased by 150 ppm. Root nutrition was also initiated when the CO₂ concentration in the leaf chamber's atmosphere decreased in the "daytime" mode. When the CO₂ concentration in the leaf chamber is around 417-367 ppm, it encourages plants to switch to root-based CO₂ absorption, which can be considered as an emergency "source" of CO₂. This is supported by the high correlation coefficients of $r = -0.859$. The impact of nitrogen nutrition on the carbon absorption of plants deserves attention. Thus, at the established limit of CO₂ absorption by plant leaves ~70 ppm, nitrogen fertilization reduced this ability to 92 ppm. Additional lighting was required for recovery. The data obtained allow us to get a more accurate picture of the transformation of CO₂ in the soil-plant-atmosphere system and to take a more balanced approach to the use of geoengineering technologies aimed at limiting the light flow to the Earth's surface.

Presenter:

Amiran Khabidovich Zanirov

Kabardino-Balkarian State University named after H.M. Berbekov, Russia



Eco-Design and Renewable Energy as Drivers of Decarbonization in Energy-Intensive Industrial Systems

Merve Balta and **Mahnaz Gümrükçüoğlu Yiğit**

Department of Environmental Engineering, Sakarya University,
Turkey

This paper presents an in-depth case study of a pump manufacturing facility, providing a comprehensive analysis of how innovative eco-design strategies impact carbon emissions and energy performance within an energy-intensive industrial setting. By systematically examining the facility's adoption of sustainable pump design in accordance with EU 547/2012 eco-design regulations, the study explores the connections between carbon footprint reduction, energy efficiency improvements, and broader socio-economic outcomes. Results indicate that electricity consumption accounts for 69% of the facility's total CO₂e emissions, underlining the significant decarbonization potential through process optimization and renewable energy use. Greenhouse gas emissions at the organizational level were calculated using the IPCC Tier 1 methodology, revealing that the majority of emissions arose from electricity consumption. Scenario analysis indicated that transitioning to certified renewable electricity would significantly reduce operational emissions and enable access to voluntary carbon markets. At the product level, efficiency assessments demonstrated that eco-design compliant pumps notably outperformed legacy models in terms of energy savings and emissions reduction. The increasing adoption of eco-designed pumps led to substantial electricity and cost savings, as well as significant avoided emissions over time. The investment in eco-design yielded a rapid payback period, underscoring the financial viability of such transitions. The study demonstrates how integrating eco-design and renewable energy sourcing can provide scalable models for other energy-intensive industrial sectors facing climate and competitiveness pressures.

Presenter:

Merve Balta

Sakarya University, Turkey



Ecotourism in a Changing Climate: The Role of Sustainability Criteria and Indicators in Protected Areas in Türkiye (Case of Artvin-Camili Biosphere Reserve)

İnci Zeynep YILMAZ

Artvin Çoruh University, Türkiye

Due to growing environmental issues and climate change, the concept of sustainability has become critically important in many sectors, particularly forestry and tourism. Forest ecosystems play a strategic role in combating climate change as carbon sinks, while also serving as the fundamental natural infrastructure for ecotourism activities. Consequently, adapting to changing climate conditions and managing the interaction between forestry activities and tourism has evolved into a holistic field within the framework of a sustainability approach.

Sustainable ecotourism is a tourism approach that is technically well-planned, economically efficient, socially responsible, ecologically sensitive, and aimed at long-term development. In protected areas, sustainable ecotourism is regarded as a comprehensive management tool that offers multidimensional contributions to climate change mitigation and adaptation processes. Managing protected areas under this framework makes significant contributions to both the conservation of forest ecosystems—which act as carbon sinks—and the strengthening of climate change adaptation processes. Activities carried out within this framework are based on models of low-impact use that respect the carrying capacity of forest ecosystems and preserve biodiversity.

A sustainable ecotourism approach supports the conservation of forest resources while also contributing to the economic and social development of local communities. Furthermore, compared to mass tourism, it produces lower greenhouse gas emissions and has more limited environmental impacts in terms of energy consumption, transportation choices, and infrastructure requirements. This helps limit land-use changes, prevent habitat destruction, and contribute to the conservation of biodiversity, thereby strengthening the resilience of forest ecosystems against climate change.

However, to effectively demonstrate these contributions, it is necessary to determine the extent to which sustainable ecotourism practices in protected areas meet planning objectives, as well as the levels of economic, ecological,

and socio-cultural sustainability. To this end, criteria and indicators are widely used around the world. However, it appears that a comprehensive set of criteria and indicators tailored to this purpose has not yet been developed in Türkiye. In my research in this field, a set of criteria and indicators for sustainable ecotourism management, considering Türkiye's forestry ecosystems and socio-economic structure, was developed, and the applicability of this set was examined specifically within the Artvin-Camili Biosphere Reserve.

The Artvin-Camili Biosphere Reserve is a protected forest ecosystem that is biologically rich and serves as a significant carbon sink. It was designated as Türkiye's first biosphere reserve under the UNESCO-MAB program in 2005. The study found that local economic activities based on forest resources have been strengthened, the level of local well-being has increased, and there have been generally positive developments in sustainability indicators. Positive results were observed in indicators related to awareness of forest ecosystems, local participation, socio-economic benefits, environmental education, and visitor satisfaction. However, to enhance the effectiveness of sustainable ecotourism activities in protected areas, it is necessary to adopt a participatory management approach, strengthen communication and educational activities with local communities, strike a balance between local expectations and tourism revenues, and activate central management mechanisms. These findings are of even greater critical importance today, as climate change increases the pressures on forest ecosystems. This is because forests' carbon sequestration capacity, the conservation of biodiversity, and the sustainability of ecotourism activities are directly linked to climate change. Therefore, the results obtained contribute not only to the development of ecotourism management but also to forestry policies and climate change adaptation strategies.

Presenter:

İnci Zeynep YILMAZ

Artvin Çoruh University, Türkiye



Soybean Mosaic Virus Infection in Three Cultivars of Soybeans Intercropped with Corn at Three Planting Densities of Soybeans

Eman Ibrahim Abdel-Wahab¹, Sherif Ibrahim Abdel-Wahab² and Tamer Ibrahim Abdel-Wahab²

¹Department of Food Legumes Research, Field Crops Research Institute, Agricultural Research Center, Egypt

²Department of Crop Intensification Research, Field Crops Research Institute, Agricultural Research Center, Egypt

In order to increase soybean seed yield while intercropping with corn while reducing soybean mosaic virus (SMV) infection, a two-year study was carried out at the Giza Agricultural Experiments and Research Station, Agricultural Research Center, during the summer seasons of 2022 and 2023. The genes for PD1 and PD2 in soybeans resistant to SMV are located on different chromosomes; one is on chromosome 13, and the other is on chromosome 20. This genetic diversity allows soybean cultivar Giza 21 to have stronger resistance to the virus, making them less susceptible to infection. These genes become activated through intercropping with corn, which triggers a response in the soybean plants' genetic makeup and enhances their ability to fight the virus. Increasing the density of soybean cultivar Giza 21 from 50% to 100% under intercropping with corn triggered the pd1 and pd2 genes, which provide resistance to SMV because the two crops compete for resources, particularly water consumption. Higher total crop yields (1.82 tons of soybean seeds and 8.67 tons of corn grains per hectare) and decreased susceptibility to SMV infection (7.85%) were the outcomes of this increased expression of resistance genes. Three soybean plant densities (50%, 75%, and 100% of sole soybean plant density) and three soybean cultivars (Giza 21, Giza 82, and Giza 111) intercropped with corn were among the nine treatments in the study, along with sole culture controls for both crops. Three replicates and a split-plot design were used in a randomized complete block design. The relevance of crop diversification in increasing overall crop yield and disease resistance was demonstrated by intercropping 100% soybean cultivar Giza 21 with 100% corn cultivar TWC 321. According to the findings, intercropping can be a sustainable farming method to increase crop yields and reduce the effects of crop diseases.

Presenter:

Eman Ibrahim El-Sayed Abdel-Wahab

Agricultural Research Center, Egypt



Factors Affecting Green Banking Technology Adoption in Bangladesh

Naimul Islam¹, Tipon Tanchangya², Junaid Rahman², Kazi Omar Siddiqi³, Tapan Sarker⁴, Kamron Naher⁵ Shishir Das⁵ and Srima Chowdhury⁶

¹Department of Accounting, Finance and Economics, University of Greenwich, UK

²Department of Finance, University of Chittagong, Bangladesh

³Department of Management Studies, Comilla University, Bangladesh

⁴School of Business, University of Southern Queensland, Australia

⁵Department of Business Administration, Presidency University, Bangladesh

⁶Department of Accounting, University of Chittagong, Bangladesh

Green banking technology (GBT) has become a strategy of promoting sustainable finance and climate action to the developing economies like Bangladesh. The study investigates determinants of customer adoption with reference to a prolonged Unified Theory of Acceptance and Use of Technology (UTAUT) framework. In particular, it focuses on the influence of performance expectancy, effort expectancy, customer awareness, personal innovativeness, system quality and bank reputation on behavioral intention and the role of behavioral intention on actual use behavior. The design adopted was that of a quantitative, cross-sectional survey data with 475 GBT users in Bangladesh. The PLS-SEM was used to analyze the proposed model.

The results showed that customer awareness, individual innovativeness, system quality, and bank reputation have a positive and significant impact on the intention to adopt GBT behavior. On the contrary, performance and effort expectancy are not that significantly affected, which makes it possible that traditional technology acceptance determinants are not pertinent in this situation. The actual use behavior is closely predicted by behavioral intention, which proves that the intention takes the central role in the transformation of perceptions into adoption. The model has a high level of explaining power and predictive relevance.

This research adds to the literature by extending UTAUT to a financial situation that is oriented to sustainability and provides real-life information that should be used by the policymakers and financiers interested in promoting green banking. Enhancing awareness campaigns, quality of systems and reputation of institutions are essential to enhance the digital green finance uptake and contribute towards the mitigation of climate in compliance with the Sustainable Development Goal 13.

Presenter:

Naimul Islam

University of Greenwich, UK



Utilizing the Metaverse: Innovative Approaches for Improved Management and Organisational Effectiveness

Ola Al Mari, Felix Velica-Martin and Pedro Brazo

Department of Business Administration and Marketing,
University of Seville, Spain

The emergence of the metaverse offers numerous innovative improvements in the management practices of enterprises. The current study provides a comprehensive overview of the revolutionary potential of the metaverse in enhancing cooperation, refining training methodologies, and establishing immersive work environments. Organizations like Meta, Microsoft, Mayo Clinic, Osso VR, Epic Games, and Roblox Corporation can transform conventional management strategies by integrating virtual and augmented reality technologies, substantially enhancing employee engagement and productivity. The current study delineates principal uses of the metaverse, including education, vehicle documentation, virtual medical investigation, virtual meetings, remote team-building exercises, and interactive training initiatives, substantiated by contemporary research and case studies. Additionally, the current study provides a direct and alternate solution based on published literature, associated with implementing these technologies, such as data security, privacy issues, and the necessity for a resilient organization infrastructure. This study recommends adopting the metaverse can yield a competitive edge by improving operational efficiency and cultivating a culture of innovation.

Presenter:

Ola Al Mari

University of Seville, Spain



A Century-Old Coal Company: Hullera Vasco-Leonesa

Leonardo Caruana de las Cagigas¹ and Julio Tascón Fernández²

¹University of Granada, Spain

²University of Oviedo, Spain

This paper analyses the historical trajectory of Hullera Vasco-Leonesa, one of the most long-standing firms in Spain's coal mining sector, from its foundation in the late nineteenth century to the later decades of the twentieth century. The study highlights the company's role in driving regional industrialisation and economic development within a sector considered strategic for national energy supply.

The research examines the firm's corporate structure and business strategies alongside the labour conditions of its workforce, offering insight into the social and economic realities of mining communities. It also explores the company's relationship with the Spanish state, emphasising the importance of public intervention, regulation, and subsidies in shaping the evolution of the coal industry. In this context, Hullera Vasco-Leonesa serves as a valuable case study to understand the interaction between private enterprise and state policy in a protected industrial sector.

Furthermore, the paper evaluates the company's capacity to adapt to technological innovation, shifting energy models, and changing political environments across different historical periods. Special attention is paid to its responses to recurrent crises that affected coal mining, highlighting both its resilience and its limitations in the face of structural transformations.

By situating the experience of Hullera Vasco-Leonesa within broader national and international trends, this study provides a representative perspective on the rise, transformation, and gradual decline of coal mining in Spain. The paper contributes to ongoing discussions on industrial change and energy transitions.

Presenter:

Leonardo Caruana de las Cagigas

University of Granada, Spain



Beyond the Greenery: The Role of Urban Green Spaces in Supporting Climate Neutrality

Carla S. S. Ferreira^{1,2}, Tomás de Figueiredo³, Zulimar Hernandez³, Cong Cong⁴, Anne Boulet², Maryam Abbasi² and António Ferreira²

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³Higher School of Agriculture of Bragança, Polytechnic Institute of Bragança, Portugal

⁴Department of Urban Studies and Planning, Massachusetts Institute of Technology, USA

Achieving urban carbon neutrality necessitates a shift beyond emission reductions toward the integration of cost-effective Nature-based Solutions (NBS) for active CO₂ sequestration. However, the absence of systematic, spatially explicit frameworks remains a significant barrier to the effective deployment of these interventions. This paper presents preliminary findings from the GreenCities project, which aims to accelerate the transition toward climate neutrality by developing a scalable, evidence-based framework for integrating NBS into urban planning. Focusing on both vegetation and soil reservoirs, this study assesses carbon storage potential across three distinct urban green spaces in Coimbra, Portugal—a mid-sized European city committed to carbon neutrality. The sites analyzed include a historic 18th-century garden with diverse shrub and tree species, a 19th-century green area characterized by grass and ornamental flowerbeds, and a contemporary open space dominated by grasslands. Utilizing a combination of high-resolution remote sensing (Copernicus Sentinel-2), ground-based data collection, and machine learning models, the research highlights the high heterogeneity of carbon storage in urban environments. While trees represent the most significant long-term reservoirs—sequestering carbon within high-density woody biomass and perennial root systems—urban grasslands serve as critical sites for stabilizing soil organic carbon pools, provided they are managed to minimize maintenance-related emissions. These results provide a foundation for spatially explicit recommendations to scale up green infrastructure interventions and support cities in reaching their climate goals.

Presenter:

Carla Sofia Santos Ferreira

Polytechnic University of Coimbra, Portugal



Carbon Capture, Sequestration and Carbon Credits As Strategic Tools for Climate Change Adaptation in the Niger Delta Oil Province of Nigeria

Adewale Dosumnu^{1,2}, Chioma Oluchukwu Maduewesi^{1,3} and Uche Osokogwu^{1,2}

¹Emerald Energy Institute, University of Port Harcourt, Nigeria

²Department of Petroleum Engineering, University of Port Harcourt, Nigeria

³Department of Geology, University of Nigeria, Nigeria

The quest to fulfil the pledges under the Paris Agreement and subsequent COPs while maintaining energy and economic stability amid population growth demands innovative, integrated strategic tools such as Carbon Capture Storage (CCUS) and Carbon Credit Tax (CCT) for sustainable development, climate resilience and adaptation. The technical and geological analysis consists of developing three-dimensional (3D) structural and reservoir simulation models of a depleted field for carbon dioxide sequestration. Another aspect of this analysis is to provide an economic incentive to companies to invest in CCUS through additional oil recovery using carbon dioxide for Enhanced Oil Recovery (EOR). The financial evaluation involves the creation of a model based on production (20years) and injection (5years) data using an Excel spread sheet to incorporate the economic parameters: Net Present Value (NPV), discounted rate, and carbon credit tax. The result reveals that 32.85Bscf corresponding to 1.7043MM storage of CO₂ injection per annum amounting to 8521632.65mt for five years. Additionally, with a Carbon credit amount of \$40 /mt, a total gross revenue of \$1701.668627MM, and NPV of \$121MM were generated at the base price of \$3/MScf of gas. The sensitivity results of the gas price at \$2MScf indicated a total gross revenue of \$1554.4MM, an NPV of \$68MM, and at \$4/Mscf reveals a total gross revenue of \$1,848.9MM and an NPV of \$174MM. The results indicate that the economic indicators suggest a positive investment and an increase in NPV with carbon tax.. Conclusively, the impact of these tools on environmental, social, and economic benefits will be effective through a robust and structured policy and regulatory framework to ensure an equitable climate adaptation by maintaining economic sustainability for an oil dependent country and compliance with climate/environmental goals.

Presenter:

Adewale Dosumnu

University of Port Harcourt, Nigeria



Effect of Climate Change on Energy Security in Sub-Saharan Africa: The Role of Renewable Energy Adoption

L.-F. Dunyoh¹, F. S. Adiku² and C. K. Teye²

¹Department of Sciences, Jasikan College of Education
University of Professional Studies, Accra (UPSA), Ghana

²Department of Finance, University of Professional Studies,
Ghana

This study examined the effects of climate change on energy security in Sub-Saharan Africa and further sought to ascertain the moderating role of renewable energy in the climate change-energy security nexus. Focussed on Sub-Saharan Africa, the study utilised balanced panel data for 20 countries, covering the period 2000–2022. Panel-Corrected Standard Errors regression technique was adopted in analysing data, to account for heteroskedasticity and cross-sectional dependence. Results indicated that climate change exerts a significant negative effect on energy security, while renewable energy adoption enhances energy security and significantly moderates the impact of climate change on energy security. Subjected to marginal analysis, the results confirmed that when renewable energy adoption levels exceed the threshold value, adverse effect of climate change becomes neutral or positive. This implies that, increasing renewable energy adoption diminishes, and eventually reverses the negative impact of climate change on energy security as shown in Fig. 2 below:

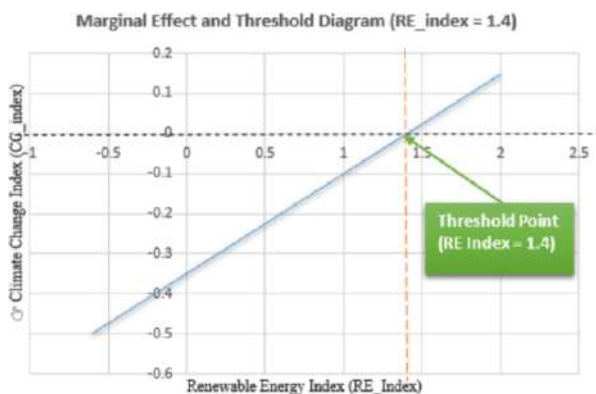


Fig-2: Marginal effect of climate change on energy security with renewable energy threshold (RE_index = 1.4). Source: Authors' computation, 2025.

The study hence posits that, climate change may have a positive impact on energy security in regions where there are high levels of renewable energy adoption. Significant to this Conference is whether Earth Science has a tremendous role to play in boosting renewable energy adoption in Sub-Saharan Africa, in consonance with UN Sustainable Development Goals (SDG) 7&13 which advocate for sustainable & clean energy for all and climate action respectively.

Presenter:

Lord-Freeman Dunyoh

Jasikan College of Education | University of Professional Studies, Accra (UPSA)
Ghana



Managing the Environmental Risks Related to the Effects of Climate Change on Urban Buildings through Innovative and Sustainable URM Infill Walls Associated to Quality Management and Use of Information Systems

José Luís Miranda Dias

Department of Buildings, National Laboratory of Civil Engineering (LNEC), Portugal

The crescent concern about environmental issues in building construction, especially related to climate changes, has led to an intense search for new construction solutions of unreinforced masonry (URM) infill walls for the envelope of buildings, which, particularly, could reduce the environmental impact of the building and increase their energy efficiency, while assuring adequate levels of indoor comfort and durability of the buildings. Furthermore, the development of preventive and curative measures for mitigation of anomalies in the building envelope, particularly related to water penetration and cracking in their infill masonry, is important to be carried out. Moreover, the implementation of adaptation measures, in particular applied to buildings, is essential to face, particularly, the incoming climate changes.

Due to climate change, besides a predicted progressive variation of the mean values of main climate variables, like mean temperature and humidity, it is expected an increased frequency and intensity of extreme climate events, particularly those associated to wind-driven rain. The crescent adverse effects of climate change rise the concern about their future impact on sustainability of construction industry and built assets, particularly on the building patrimony, not only in ancient buildings (old traditional construction), but also in recent buildings with reinforced concrete structure, resulting in corresponding challenges to building conservation enterprises.

The conservation and renovation of heritage buildings is a multifaceted and intricate operation, which could entail a management approach that systematically connects the diverse valences and the use of information technology (IT) required to perform the complex task of heritage building conservation. The preservation of cultural heritage has gradually incorporated information technology (IT) to create building models in the data processes and diagnosis stages, on a multidisciplinary planning basis. Here, an approach to management and conservation related to heritage buildings with use of information technology is presented, particularly with a description

of the basic factors of climate change influencing moisture presence and cracking of URM infill walls.

To face the effects of climate change, it is advisable the development of new technologies for environmental solutions regarding the building facades especially their URM infill walls, aiming to derive to solutions with a significant carbon footprint, particularly through, for example, the use of masonry blocks for walls of environmental-based solutions of agro-industrial waste/bio-based materials, and walls of lightweight concrete blocks; selection of construction products for facades with lower coefficient of thermal expansion, when directly exposed to solar radiation; use of flood resistant materials, such as protective paintings of facade elements, which are preferable in buildings potentially subjected to damage by floods.

The external envelope of reinforced concrete buildings (RCS buildings) is subjected to external environmental actions, particularly those related to wind action, which could expose their unreinforced masonry (URM) infill walls, in case of high winds, to intense out-of-plane loads (OOP loads), and in-plane loads (INP loads). It could be considered relevant the impact of cracking of URM infills due the wind loads, which requires the study of their possible mitigation measures.

Therefore, the negative effects of climate change on building performance are important to be reduced, particularly through the change of the construction technology and inclusion of new advantageous construction technologies. Innovative solutions have been used progressively, in the last decades, for the construction of unreinforced masonry (URM) infill walls of the envelope of buildings with reinforced concrete structure (RCS buildings), particularly to enhance their capacity to face the gravity and environmental loads. The interest here is the evaluation of the basic characteristics of innovative/current and environmental-based solutions of masonry walls of buildings, with a particular focus on the assessment of main performance characteristics of some type of masonry units: masonry blocks for walls of environmental-based solutions of agro-industrial waste/bio-based materials; masonry blocks made from lightweight concrete (innovative or current solutions).

An analysis is made of the hygro-thermo-mechanical behavior of URM infill walls, mainly assessing the basic performance characteristics of innovative/current and environmental-based solutions of masonry walls of buildings, with a specific emphasis on the assessment of mechanical and hygrother-

mal properties of some type of masonry units. Essential elements about masonry wall characteristics are summarized, especially referring to the main types of masonry units and mortar joints, with a description of the innovative/current and environmental-based solutions mainly based on masonry units made with bio-based and waste materials. Next, a basic description of the most important performance requirements of these types of URM infill walls is presented, particularly showing the main performance characteristics of the referred masonry units and the specific performance characteristics of URM infill walls. Relevant mechanical and hygrothermal characteristics of particular types of masonry units are evaluated. A basic approach to management and conservation related to heritage buildings with use of information technology is presented, particularly with a description of the basic factors of climate change influencing moisture presence and cracking of URM infill walls and of methodology for systematization of analysis of the main anomalies the envelope of buildings. Finally, the cracking of URM infills walls associated to wind loads and their impact in the OOP strength against wind loads is discussed and respective mitigation is presented.

Presenter:

José Luís Miranda Dias

National Laboratory of Civil Engineering (LNEC), Portugal



Co-Seismic Earthquake Lights (EQLs) during the 2023 Morocco Earthquake: Observations and an Atmospheric Friction Model

Bendaoud Saâd

National School of Applied Sciences of Safi, MISCOM
Laboratory, Cadi Ayyad University, Morocco

The Mw 6.8 Al-Haouz earthquake that struck Morocco on 8 September 2023 was not only a devastating seismic event but also a significant source of co-seismic earthquake lights (EQLs). This study presents a detailed analysis of these luminous phenomena, which were widely observed as intense blue to bluish-white flashes in the epicentral region. The investigation is based on a compilation of video evidence from multiple surveillance cameras, complemented by reliable eyewitness testimonies. A critical temporal correlation is established between the recorded EQLs and the seismogram from the nearest seismic station (TIO), revealing that the luminous emissions were systematically associated with the arrival of high-amplitude S-wave trains. The analysis of video footage, which captured both the EQLs and the shaking of environmental objects, allowed for a precise synchronization of the light events with specific phases of the ground motion.

Based on these observations, we propose a novel mechanism for EQL generation that departs from traditional stress-activated rock charge theories. We argue that the primary energy source for EQLs is the mechanical energy of the seismic waves themselves, transmitted into the atmospheric column. We demonstrate that two necessary conditions must be met for EQLs to occur: a significant earthquake magnitude ($M_w > \sim 5$) to provide sufficient energy, and the presence of clouds in the epicentral sky. The shaking induced by seismic S-waves agitates the atmosphere, leading to intense friction and charge separation between air molecules and cloud ice microcrystals, analogous to the electrification process in thunderstorms. When the resulting electric field between the ground and clouds reaches the disruptive threshold, a rapid discharge occurs, producing the observed co-seismic EQLs. This atmospheric friction model provides a unified explanation for the occurrence, timing, and characteristics of the EQLs observed during the Al-Haouz earthquake.

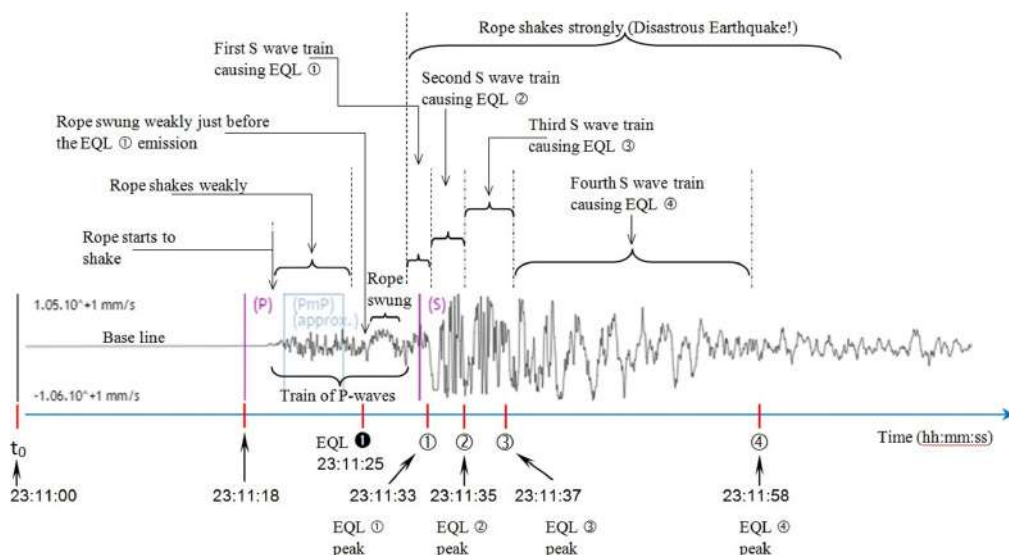


Figure 1. Correlation between seismic events and the corresponding modes of seismic vibrations on the seismogram of the ITO station at Marrakech City, Morocco. The recording of the seismogram begins at 23:18:00 locale time. EQL ① was observed at 23:11:33, EQL ② at 23:11:35, EQL ③ at 23:11:37, and EQL ④ at 23:11:58. EQLs ② and ③ were triggered by the powerful S-waves of the earthquake.

Presenter:

Bendaoud Saâd

Cadi Ayyad University, Morocco



E-government, Governance and Sustainable Development: What Synergy for African Countries?

Ahlam Er-rahmani and Aziz Bensbahou

Economics and Public Policy Laboratory, Faculty of Economics and Management, Ibn Tofail University, Morocco

This paper seeks to measure the dynamics of E-government in 51 African countries in comparison with other regions of the world over 2003–2023 and test the effect of its various dimensions in ensuring successful governance and promoting sustainable development. By combining an analytical and econometric approach, this paper attempts to 1) verify the relationship that can link E-government to governance, 2) evaluate the role of governance in the improving or worsening of the level of sustainable development, and, 3) verify the impacts that E-government could have on the level of sustainable development. The results of the econometric estimates confirm the positive dynamics achieved by African countries in the implementation of E-government, with a significant impact on the improvement of sustainable development indicators and those related to the governance indicators. They also emphasize bridging the gaps between countries with geographical proximity, fostering regional cooperation and integration, as well as addressing the similarities and complementarities in their socio-economic and institutional characteristics.

Presenter:

Ahlam Er-Rahmani

Ibn Tofail University, Morocco



Numerical Foundations for Computational Modeling in Wind Energy

Nascimento Andreia Aoyagui, Silva Mylena Carvalho
and **Mariano Felipe Pamplona**

Universidade Federal de Goiás, Brazil

The reliability of wind energy technologies depends not only on large-scale climate assessments, but also on the soundness of the numerical methods used to describe aerodynamic phenomena. Computational fluid dynamics (CFD) plays a central role in wind energy research, and two-dimensional CFD remains an essential environment for the development, testing, and validation of numerical methods, particularly in the early stages of model formulation and assessment. This work presents ongoing numerical developments in two-dimensional CFD applied to aerodynamic problems based on airfoil sections representative of wind turbine blades. The study focuses on numerical robustness, stability, and physical consistency of the proposed approach, which is currently at an experimental validation stage. Rather than targeting direct estimates of energy performance at this point, the emphasis is placed on the reliable reproduction of the dominant physical mechanisms governing the flow. The numerical framework is evaluated through comparisons with available experimental data, with attention given to the prediction of boundary layer behavior, separation onset, and unsteady aerodynamic responses. Sensitivity analyses related to mesh resolution and time-step selection are also discussed, providing insight into the numerical behavior and limitations of the method. These analyses help clarify the conditions under which the model delivers consistent and physically meaningful results. By addressing fundamental issues associated with numerical performance and experimental validation, this research contributes to the improvement of computational tools used in wind energy studies. Strengthening confidence in numerical foundations at the two-dimensional level supports the future development of more complex models and larger-scale applications, ultimately contributing to the advancement of wind energy technologies within the broader context of the energy transition and climate change mitigation.

Presenter:

Andreia Aoyagui Nascimento

Universidade Federal de Goiás, Brazil



Correlation of Space Weather with Biological Indicators – A Case Study: Myocardial Infarctions

Luiz Felipe Rezende

INPE - National Institute for Space Research, Brazil

Space weather is greatly affected by geomagnetic disturbances (GMDs) that occur during or after intense solar events such as coronal mass ejections (CMEs), which expel substantial amounts of electromagnetic particles into space. GMDs occur most frequently at the peak of the 11-year solar cycle. The question of a probable correlation between solar activity and biological indicators was already being discussed by scientists at the beginning of the last century (from ~1910), when synchronous variations were observed between the number of sunspots on the Sun's equator and epidemics, epizootics, reproduction of some types of bacteria, and animal migration. One emerging link includes the impact of space weather on myocardial infarctions (MI). In our study, we examined the correlation between MI and GMDs in Brazil. We used a database from the public health in Brazil, focusing on the city of São José dos Campos (23° 10' 44" S, 45° 53' 13" W), located in the state of São Paulo, during the period of 1998–2005. We focused on admissions for MIs. Additionally, we incorporated Planetary Index (Kp) data as an indicator of variations in the Earth's geomagnetic field resulting from solar disturbances, categorized as quiet, moderate, or disturbed days. In our analysis, we employed two methods: statistical counting and the unsupervised clustering known as K-Means, considering the attributes of age, sex, and geomagnetic condition. Overall, our results provide evidence that women may exhibit a higher susceptibility to the effects of geomagnetic disturbances caused by solar activity on MI.

Presenter:

Luiz Felipe Rezende

INPE - National Institute for Space Research, Brazil



Diagnosing Rebound Effects in Territorial Circular Economy Transitions: Implications for Climate Governance

Rachida Bouhid

Department of Strategy, Social and Environmental Responsibility, School of Management, Université du Québec à Montréal (UQAM), Canada

Circular economy strategies are increasingly positioned as climate mitigation instruments. Their evaluation often assumes that efficiency, recycling, and material recirculation will reduce environmental pressures. Yet lower costs, easier access, market expansion, or intensified circulation may trigger rebound dynamics that offset anticipated savings. Existing research mainly treats rebound as a product- or sector-level efficiency loss, offering limited insight into territorial infrastructures, governance arrangements, and sociotechnical lock-ins. This presentation develops a transition-sensitive diagnostic framework for circular rebound effects within territorial circular economy transitions. Drawing on a comparative synthesis of ecological economics, sociotechnical transition theory, industrial ecology, the sociology of practices, and territorial governance research, the framework connects micro-level practices, meso-level organizational strategies, and macro-level policy configurations. It introduces the Territorial Circular Rebound Effect to explain how infrastructural capacity, governance coordination, regional specialization, and socio-metabolic interactions shape rebound outcomes. Two complementary distinctions structure the findings. First, the framework identifies counterproductive, neutral, and enabling rebound configurations. Second, it specifies three systemic functions: inertia, tension, and inflection. Rebound dynamics may stabilize incumbent trajectories, expose structural contradictions, or become actionable signals for adaptive reorientation. These outcomes depend on substitution integrity, circulation intensity, scaling logics, infrastructural lock-ins, and governance capacity. Rather than treating rebound solely as an ex-post mitigation problem, the presentation argues for integrating rebound diagnostics into territorial monitoring. This approach can support policy redesign by assessing whether circular practices displace primary production, reduce absolute throughput and associated emissions, and remain compatible with sufficiency-oriented climate pathways. It provides policymakers, territorial actors, and organizations with a structured basis for distinguishing circular activity from genuine systemic transformation.

Presenter:

Rachida Bouhid

Université du Québec à Montréal (UQAM), Canada



Similarity Analysis: Classification of Time Series Data Using Supervised and Unsupervised Learning

David J Corliss

Peace-Work, USA

Traditional climate modeling often relies on linear regressions, flattening non-linear, asynchronous shifts across multi-variable ecosystems. This presentation applies Similarity Analysis to multidimensional climate time series using the open-source python Aeon toolkit. Instead of measuring isolated scalar variations, this methodology constructs distance matrix to quantify the difference in shape between different events.

This distance metric allows events to be classified into groups of events having a similar pattern. The framework clusters together geographically distinct regions experiencing parallel trajectories of ecological degradation, allowing the identification and projection of environmental structural anomalies where localized trends deviate sharply from historical baselines. This provides an early-warning signal for sudden micro-climate shifts and severe weather risks.

While open-source code in python used in the presentation, the emphasis is on climate applications of similarity analysis for classifying patterns over time; this methodology can be developed using any of several leading statistical analysis systems. This session demonstrates how climate researchers can leverage similarity analysis using machine learning to translate noisy environmental data into actionable, localized predictive pathways. Attendees will gain a framework for spatial-temporal trend clustering, focusing on quantifying the difference between patterns over time for forecasting environmental risks. Examples include population trajectories of marine mammals in disparate geographic areas impacted by climate change and an exploration of the potential impact of hyperscale data centers on climate based on comparison to the climate trajectories of cities experiencing rapid growth.

Presenter:

David J Corliss

Peace-Work, USA



Building Pathways to Sustainable Wastewater Management Systems in Developing Countries Using Semantic Network Models

Fernando Ramos-Quintana

Tecnológico de Monterrey, México

Wastewater management (WWM) systems depend on the complex dynamics of multifactorial anthropogenic interactions, encompassing demographic, socioeconomic, sociopolitical, technological, and cultural factors that operate distinctly in developing countries. Weaknesses in WWM often stem from the multifactorial interactions, yet modeling their precise environmental impacts remains a challenge. While public policy seems to be the typical solution, policy formulation in developing nations is commonly hindered by weak institutional frameworks, inefficient urban planning, and lack of data for generating actionable knowledge. To address these gaps, policy design must be grounded in rigorous system analysis, the integration of the Resilience-Adaptability-Sustainability (RAS) triad, and insights from the perspective of environmental psychology.

This study uses semantic networks (an A.I. based approach) to model these multifactorial systems, mapping how intangible anthropogenic dynamics produce tangible harmful factors that damage water bodies, ecosystem services, and marginalized urban areas, among the most important.

Furthermore, we present an analysis suggesting that community behavioral patterns hinder the development of the Resilience-Adaptability-Sustainability triad, viewed from the perspective of environmental psychology.

Ultimately, this framework generates actionable knowledge to construct pathways toward sustainable, context-driven wastewater management.

Presenter:

Fernando Ramos-Quintana

Tec de Monterrey, México

DAY 02



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SPEAKER TALKS



The Invasive Coconut Scale, *Aspidiotus rigidus* (Hemiptera: Diaspididae): A Continuing IPM Challenge in the Philippines

Johana C. Orense

Philippine Coconut Authority (Retired), Philippines

Aspidiotus rigidus is an invasive pest that severely impacted the Philippine coconut industry. The pest infestation caused yield reduction and farmers' income, decline in crop quality and disrupted the national replanting program of the Philippine Coconut Authority (PCA).

A combination of cultural, chemical, biological, and regulatory strategies was implemented to curtail further devastation but recurrence and spread to new areas are still being experienced to date. Further investigations are still on-going to determine pest management practices that would have long lasting negative effects to the pest.

Presenter:

Johana C. Orense

Philippine Coconut Authority (retired), Philippines



From Green Building Guidelines to Low-Carbon Design Decisions: An AHP-Based Prioritisation Framework for High-Rise Residential Buildings under LEED v5

Chih-Ju Lin¹ and **Bih-Chuan Lin²**

¹Master Student, Graduate School of Architecture
Da-Yeh University, Taiwan

²Assistant Professor, Graduate School of Architecture
Da-Yeh University, Taiwan

The buildings and construction sector faces growing pressure to reduce carbon emissions, and embodied carbon has become increasingly critical in high-rise residential projects because structural systems, material selection, and construction methods are largely determined at the design stage. Although LEED v5 (BD+C) strengthens climate-oriented requirements and calls for whole-life carbon thinking, design teams still lack a clear method for prioritising low-carbon strategies under real project constraints. This study develops an expert-informed AHP-based prioritisation framework for low-carbon high-rise residential design. A structured review of low-carbon building literature and LEED v5 requirements was used to identify candidate strategies. Semi-structured expert interviews refined and validated the criteria, and the Analytic Hierarchy Process translated expert pairwise comparisons into strategy weights with consistency testing. Seven strategies were evaluated: structural optimisation, lightweight structural design, low-carbon and recycled materials, low-carbon construction methods, durability-oriented design, material efficiency design, and modular design. Results show that low-carbon and recycled materials (0.243), structural optimisation (0.198), and modular design (0.176) form the highest-priority strategy group, accounting for more than 60% of overall importance. The framework advances design-stage decarbonisation by translating LEED v5 climate ambition into transparent decision logic. Its value lies not only in ranking strategies, but in helping architects, engineers, developers, and policymakers allocate early design effort toward higher-impact carbon reduction actions in high-rise residential projects.

Presenter:

Chih-Ju Lin

Da-Yeh University, Taiwan



From Proximity to Ageing-in-Place: A Multi-Scale Evaluation of Age-Friendly Urban Environments

Tran Le Khanh Thu¹ and **Bih-Chuan Lin²**

¹Master Student, Graduate School of Architecture
Da-Yeh University, Taiwan

²Assistant Professor, Graduate School of Architecture
Da-Yeh University, Taiwan

Population ageing is reshaping how high-density cities should be understood, planned, and adapted. While proximity-based planning has gained increasing attention through concepts such as the 15-minute city, short physical distance alone does not necessarily ensure that older adults can safely and independently access housing, services, public spaces, healthcare, and social networks. This study therefore shifts the discussion from proximity to usable accessibility and examines ageing-in-place across interconnected spatial scales.

A multi-scale evaluation framework was developed by integrating age-friendly planning, ageing-in-place, proximity-based urbanism, and urban sustainability. The framework organizes the urban environment into three interdependent scales: the Micro scale, addressing housing adaptability, safety, environmental comfort, and everyday living; the Meso scale, focusing on walkability, local services, public space, community support, and neighbourhood continuity; and the Macro scale, encompassing mobility systems, healthcare accessibility, green infrastructure, governance, and broader urban networks. International case studies were used to identify transferable spatial principles, followed by evaluation by seven experts using quantitative ratings and qualitative responses to examine the relevance and contextual applicability of the proposed criteria.

Preliminary findings indicate strong expert support for green infrastructure, accessible public spaces, local services, pedestrian safety, community care, neighbourhood preservation, and environmental comfort. Greater variation emerged around public transportation, walkability, and barrier-free housing, reflecting the specific conditions of high-density Asian cities. Using Ho Chi Minh City as the contextual setting, the qualitative findings further reveal that motorcycle-based mobility, alley networks, existing housing constraints, informal care systems, traditional markets, and community relationships substantially influence how accessibility is experienced by older residents.

The study argues that age-friendly planning should not simply replicate universal spatial standards or fixed proximity thresholds. Instead, principles such as walkability, barrier-free environments, and the 15-minute city require context-sensitive translation. The proposed framework consequently reframes existing urban fabric as potential ageing infrastructure and emphasizes continuity across the home, neighbourhood, and city as a critical condition for ageing-in-place. The findings provide a preliminary basis for developing locally responsive strategies for age-friendly urban environments in high-density cities.

Presenter:

Tran Le Khanh Thu

Da-Yeh University, Taiwan



Ship-Generated Waste Management Practices, Challenges and Innovations On-Board and at Ports: A Systematic Review

Abhijit Arvind Mohite and **Emil Mathew**

School of Maritime Management, Indian Maritime University,
India

The increasing volume of global ship traffic and stringent environmental regulations have made ship-generated waste management a critical issue in the maritime industry. The main objective of this study was to examine seminal waste categories according to the International Convention for the Prevention of Pollution from Ships (MARPOL), treatment techniques, regulatory mechanisms, and technologies that impact waste management in maritime environments. Methodologically, an exhaustive search of various academic databases and scholarly peer-reviewed studies published from 2016 to 2025 was conducted, following strict inclusion and exclusion criteria. Waste management in maritime environments is governed by diverse regimes, from global IMO conventions such as MARPOL to regional agreements tailored to specific seas. National laws implement these standards, often with stricter rules, and individual ships and ports establish their own operational plans. This multilayered approach aims to prevent pollution in various marine spaces. The PRISMA model was used to ensure a clear and strict selection procedure, reducing the original search of 192,965 references to 103 relevant articles. This systematic review examined the various challenges and innovations in waste management on ships and at port facilities. The study results highlight major challenges, such as poor infrastructure at ports, poor waste segregation systems on vessels, and enforceability issues in regulatory protocols, such as MARPOL Annex V. Technological solutions, such as AI-based waste handling systems, waste-to-energy conversion technologies, and automation, are posing themselves as options for enhancing waste handling efficiency. However, the common use of such technologies is impeded by uneven regulations, resource constraints, and a lack of training opportunities. This review calls for increased coordination between shipping companies, port administrators, and technology enablers to improve waste management systems. The findings indicate that a synergistic approach combining policy enhancement, technological innovation, and international collaboration is essential for ensuring sustainable ship-generated waste management practices and reducing environmental threats to marine ecosystems.

Presenter:

Abhijit Arvind Mohite

Indian Maritime University, India



DripAlyze: Internet of Things Based Water Leakage Detection System for Smart Resource Management

Maitri Patel, Jyotin Kateshia, Dwij Baxi, Devkumar Chaudhari and Harsh Patel

School of Computing and Technology, Institute of Advanced Research, India

DripAlyze, a novel Internet of Things based system designed to address the critical issue of undetected water leakage. The proposed system employs low-cost ESP32 microcontrollers and YF-B2 Hall effect flow sensors with adaptive detection algorithm to monitor water consumption patterns in real-time. The system achieves 95% sensitivity for leaks as minimal as 0.2 L per minute while maintaining false positive rates below 1.2%. The system is energy efficient as it operates on only 1.5 W of power. Experimental results demonstrate that DripAlyze reduced water wastage by 20%, conserving approximately 5000 L of water compared to conventional manual inspection methods. The companion mobile application provides users with consumption analytics and facilitates immediate connection to repair services through an integrated booking system. This research delivers an affordable, scalable smart building solution for real-time water leak detection, scalable from household to institutional use. The system saves water and provides economic advantages for consumers. In the future, the system can be augmented with predictive maintenance, camera technology for remote verification of leaks to minimize spurious alarms, and context-aware notifications.

Publication Credit

This research was originally published as an Original Research Article in:

Patel, M., Kateshia, J., Baxi, D. et al. DripAlyze: internet of things based water leakage detection system for smart resource management. Int. j. inf. tecnol. (2025). <https://doi.org/10.1007/s41870-025-02759-8>

Presenter:

Maitri Patel

Institute of Advanced Research, India



The Solar Activity and El Niño/La Niña Link: Effect on Surface Meteorological Elements

Rajasri Sen Jaiswal¹, Vinotha M² and V S Neela²

¹Gopalan College of Engineering and Management, India

²Sona College of Technology Salem, India

In this paper, the authors aim to seek the origin of El Niño and La Niña. The investigation reveals that the origin of El Niño and La Niña is embedded in the solar cycle. They made an effort to investigate the impact of the solar cycle on Earth's climate, specifically in the context of rainfall and temperature, as well as El Niño and La Niña, and their relationship to world famines. The study shows that the peak sunspot number (SSN) often occurs in pairs. Multiple peaks are also seen frequently. The La Niña follows multiple peaks, or sometimes, both occur simultaneously. The El Niño usually follows the solar minima, though not always. This study reveals that the SSN trough will occur in 2020. The multiple SSN peak is likely to occur during 2023-2028, predicting a La-Niña during this period. A plot of historical data on famines in different parts of the world indicates their occurrence following multiple SSN peaks and very high SSN values. The study shows that the total solar irradiance (TSI) bears a strong correlation with the SSN. Besides, the cosmic ray flux decreases as the SSN and the TSI increase. The monthly and yearly variations of SSN, TSI, and temperature show increasing trends over the years, indicating increased warming as the years advance. However, none of these parameters bears significant correlations with the temperature, either independently or together, implying that some other factors are also responsible for determining the temperature. The study shows no direct relationship between rainfall and the SSN. However, several years show a similar trend between the two. The investigation indicates a direct influence of the solar cycle on world climate.

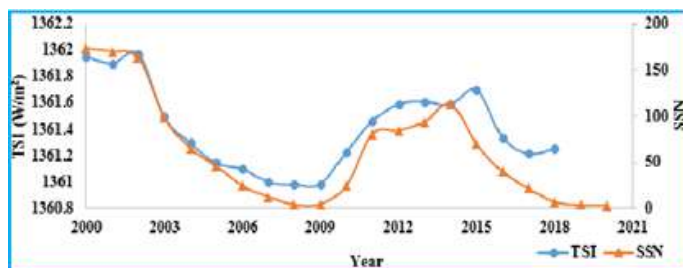
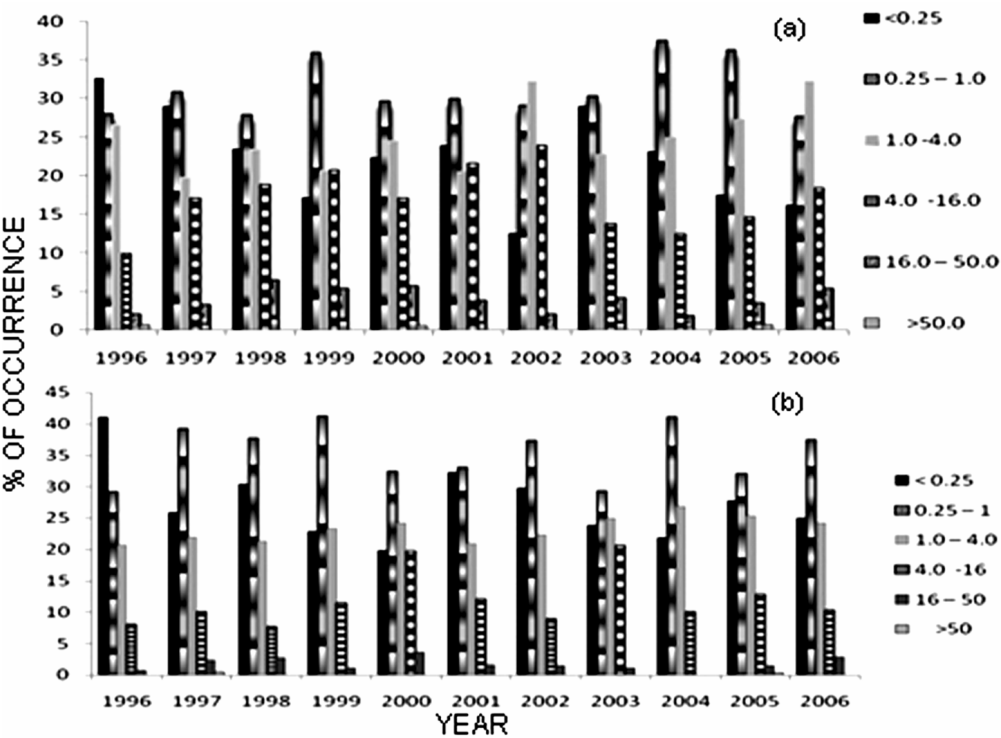


Fig. 2. The yearly variation of mean SSN (2001-2020) and TSI (2001-2018)

The investigation reveals the effect of El Niño and La Niña on the individual monsoon seasons of Salem, a suburb in the southern peninsula of India. The southwest and northeast monsoons ahead of the El Niño of 1997, 2002, 2004, and 2006 received less rainfall. La Niña brought above-normal rainfall in the southwest and northeast monsoon in 1998 and 2000. However, the pre-monsoon months preceding both El Niño and La Niña events received below-normal rainfall in some years and above-normal rainfall in some. Notably, the occurrence of below-normal rainfall at Salem was not always associated with the El Niño. Similarly, the above-normal was not always associated with La Niña. In fact, not all El Niño/La Niña events produce the same effect at a particular station, in view of the fact that the shape and size of El Niño/La Niña events vary.



Presenter:
Rajasri Sen Jaiswal
Gopalan College of Engineering and Management, India



The Relevance of Sustainability in Education

Riya Gupta¹, Vaibhav Pandey² and Himanshu²

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Inclusive education is increasingly vital as globalization accelerates and nations grapple with complex environmental, social, and economic challenges. This chapter examines sustainability in education as a transformative pedagogical practice for students. Integrating sustainability into education is crucial for equipping upcoming generations with the skills and mindset needed to thrive in a responsible workforce. Curriculum design, experiential learning, and community engagement constitute vital components of an inclusive approach to effectively embed sustainability in education. Projects such as community service initiatives enable students to apply theoretical concepts and develop a practical understanding of sustainable development. Despite its importance, incorporating sustainability into education has faced considerable challenges, including limited resources and resistance to change. Educational institutions must adopt innovative strategies, such as collaborative partnerships within and across institutions, alongside professional development programs, to successfully integrate sustainability into pedagogical practices. Equipping students with sustainability competencies empowers them to address contemporary challenges and become socially responsible citizens. This chapter emphasizes sustainability as an integral component of education, essential for building a resilient and sustainable future for all stakeholders.

Presenter:

Riya Gupta

AURO University, India



Beyond Connectivity: An Intelligent Emergency Communication for Localization and Evacuation in High-Altitude Disasters

Barnali Dey

Department of Information Technology, Sikkim Manipal
Institute of Technology, India

In high-altitude and mountainous regions disaster situation like flash flood, landslides or avalanches present significant challenges for emergency communication, search and rescue operations, and timely evacuation of affected people. Most conventional communication infrastructure, like cellular networks and fixed communication towers, may become unavailable due to extreme weather conditions, power failures, or physical damage. In such situations, an Ad hoc network can provide infrastructure-independent communication. However, their performance may be constrained by dynamic topology, limited spectrum availability, node mobility, energy constraints, and intermittent connectivity. And although studies have been done, there still remains a research gap in developing an integrated, adaptive framework specifically designed for locating and tracking people during evacuation in high-altitude disaster environments. Existing approaches primarily focus on communication or spectrum management and rarely consider joint reliable localization, dynamic spectrum selection, energy efficiency, and evacuation requirements. Furthermore, the effects of mountainous terrain, sparse infrastructure, intermittent links, and rapidly changing channel conditions remain insufficiently addressed. To address this gap, a Cognitive-Radio-enabled Mobile Ad Hoc Network (CR-MANET) for locating, monitoring, and supporting the evacuation of people in high-altitude disaster scenarios may be adopted. The framework dynamically identifies and utilizes available spectrum while establishing a self-configuring multi-hop network among rescue personnel, UAVs, wearable or mobile devices, and temporary communication nodes. It basically utilizes adaptive spectrum selection, location-aware routing, mobility management, and energy-efficient communication to maintain connectivity under highly dynamic conditions. The approach aims to provide a resilient, infrastructure-independent communication and localization solution capable of improving situational awareness, prioritizing rescue operations, and supporting safer and faster evacuation of people in high-altitude disaster environments.

Presenter:

Barnali Dey

Sikkim Manipal Institute of Technology, India



PFAS Pollution: A New Emerging Threat in Pakistan

Its Environmental Distribution, Health Risks, and Advanced Remediation and Mitigation Strategies — A New Perspective

Erum Bughio¹ and Amure Bughio²

¹Department of Poultry Production, Faculty of Animal Production and Technology, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Pakistan

²Pharm. D. Miami Florida, USA

Per- and polyfluoroalkyl substances (PFAS), also known as "forever chemicals," pose a severe environmental and public health threat across Pakistan. The study evaluates the widespread distribution, cross-compartmental migration, and associated health risks of PFAS contamination across Pakistan's unique ecological and urban sectors to inform context-specific policy and remediation strategies. Early review literature provided baseline insights, but recent 2026 studies reveal widespread contamination across a number of ecological compartments. PFAS have been detected in agricultural soils near open dump sites across 13 districts (with total concentrations ranging from 29.8 to 703 ng/g, dominated by trifluoroacetic acid), Significant bioaccumulation was confirmed in aquatic bird feathers along the Ravi and Sutlej Rivers, airborne emissions in industrial sectors (e.g., non-stick cookware manufacturing in Punjab), beverage packaging, and public water distribution systems. PFAS poses a serious health threat as exposure is linked to thyroid dysfunction, immune/endocrine disruption, and agricultural bioaccumulation. PFAS pollution in Pakistan has escalated from localized industrial discharge into a multi-media ecological and public health emergency. Catering to this crisis requires integrated One Health management, machine-learning-driven monitoring, advanced microbial/MOF-based remediation technologies, and urgent policy enforcement specifically designed for Pakistan's local socio-environmental context.

Presenter:

Erum Bughio

Shaheed Benazir Bhutto University of Veterinary and Animal Sciences
Pakistan



Exploring Oceanic Depths: Unveiling Hidden Treasures with IoT and Ensembled Deep Hybrid Learning Model

Sujilatha Tada and V. Jeevanantham

Department of Computer Science Engineering, Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology, India

The ocean covers more than 70% of the Earth's surface, yet much of it remains unexplored due to harsh environmental conditions, low visibility, and limitations of conventional monitoring systems. This research presents an advanced framework for ocean exploration and underwater surveillance using Internet of Things (IoT) technology combined with an ensembled deep hybrid learning model.

The proposed system employs underwater sensors, cameras, and communication modules to collect real-time environmental and visual data from marine ecosystems. To overcome underwater image degradation, enhancement techniques are applied before data analysis. The enhanced data is then processed through a hybrid deep learning architecture that combines multiple models to improve the detection, classification, and tracking of underwater objects with high accuracy and reliability.

The integration of IoT enables continuous remote monitoring and efficient data transmission, supporting faster decision-making for marine researchers and environmental agencies. The system can be applied in biodiversity conservation, underwater resource exploration, pollution detection, and climate change studies.

This work demonstrates how intelligent technologies can transform marine observation by making underwater exploration smarter, more efficient, and more scalable. The proposed framework contributes to sustainable ocean management and opens new possibilities for discovering hidden treasures beneath the sea.

Presenter:

Sujilatha Tada

Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology
India



What We Can Learn From India a Forerunner in Community Centric Forest Management: An Insight for Global Forest Policy and Governance

Nick Lalrinmawia¹, P.C. Vanlalhluna², R. Lalengmawia³, Vanlalhruaii Ralte², B.C. Lalremruata⁴, and F. Lalnunmawia¹

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Community-based forest management has gained global prominence and this commentary explores the socio-ecological dynamics of forest management in India, highlighting its role in biodiversity conservation, carbon sequestration, and forest regeneration. Community management has shown significant ecological improvements in areas of forest health, economic benefits and climate mitigation. However, certain challenges persist which includes anthropogenic disturbances, inequitable benefit sharing, and exclusion of marginalized groups. The integration of indigenous knowledge, economic factors, and gender equity into forest governance strategies is critical for the long-term success of these programs. Drawing on India's policy and community-driven experiences, this policy forum offers actionable recommendations for global policymakers to ensure effective forest governance.

Presenter:

Nick Lalrinmawia

Mizoram University, India



Evaluation of Kinetic Models for Orange G Dye Removal Using Hydrodynamic Cavitation at Different Initial Dye Concentrations

Amir Nasiri and **Mansoorh Soleimani**

Department of Chemical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Hydrodynamic cavitation (HC) has attracted researchers' attention as an advanced wastewater treatment technology for pollutant removal across various industries, including the textile and paper industries. This study examined the removal of Orange G (OG) dye in a hydrodynamic cavitation system under optimal conditions reported in a previous study: an inlet pressure of 4 bar, pH 3, and an initial dye concentration of 10 ppm. The removal of Orange G dye was evaluated at initial dye concentrations of 100 and 200 ppm, and different kinetic models were fitted to three concentration levels (10, 100, and 200 ppm) based on conditions determined in a previous study.

The experimental findings demonstrated that higher initial OG concentrations reduced the removal efficiency, reaching 4.64% at 100 ppm and 2.64% at 200 ppm over the 2 h of treatment, whereas the maximum removal efficiency of 9.8% was obtained at a dye concentration of 10 ppm under the same operating conditions.

To characterize the removal trend, five kinetic models were investigated, including pseudo-first-order (PFO), pseudo-second-order (PSO), modified pseudo-first-order (MPFO), and two empirical non-linear models. Non-linear regression was conducted for MPFO and two empirical models using Microsoft Excel Solver. Model performance was assessed by the coefficient of determination (R^2). Based on the results, the concentration-modified empirical model exhibits the closest agreement with experimental data across all concentration levels. The model achieved R^2 values of 0.98, 0.99, and 0.93 at 10, 100, and 200 ppm, respectively, indicating a suitable fit to the experimental data.

Accordingly, these results suggest that although hydrodynamic cavitation alone is less effective at higher Orange G concentrations, the proposed empirical kinetic model closely fits the removal trends and accurately describes the process over a wide range of concentrations.

Presenter:

Amir Nasiri

Amirkabir University of Technology (Tehran Polytechnic), Iran



Internet of Things-Driven Waste Management: Paving the Way for Sustainable Smart Cities

Khadija Salim Al Yarubi¹, Sallam O. F. Khairy¹, S. M. Emdad Hossain¹ and Gasim Hayder²

¹Department of Information Systems, College of Economics, Management and Information Systems, University of Nizwa, Oman

²Department of Civil and Environmental Engineering, College of Engineering and Architecture, University of Nizwa, Oman

Rapid urban growth around the globe has created major waste management challenges, particularly in locations that have experienced rapid urban expansion, such as Oman. In the following study, Al-Duqm as Oman's primary economic zone is investigated, where outdated waste management practices are at odds with the national Sustainable Development Goals. In order to address this problem, we present a system that includes the use of Internet of Things sensors, combined with GPS tracking features and artificial intelligence capabilities. With this waste collection system, we aim to achieve enhanced speed and cost effectiveness and environmental sustainability. Ultrasonic sensors with AI-based route planning installed in waste bins enable the system to minimize unnecessary waste collection rounds by trucks. Laboratory evaluations of our system demonstrated a 28% reduction in fuel consumption and a 15% decrease in operational expenses, achieving collection performance levels that improved by more than 41.5%. The unique quality of this approach consists of aligning multifaceted technologies to fulfill Al-Duqm's special requirements for its dry climate and expanding infrastructure. The combination of sensor-generated data enables trucks to navigate empty container spaces, thus saving time and lowering emission levels. The findings of this study aid Oman in reaching its 2040 targets, in addition to Global Sustainable Development Goal 11, while simultaneously enhancing environmentally friendly initiatives in urban areas. The results of this study demonstrate how modern smart systems transform expensive waste management services into an intelligent environmental tool, thus providing examples for other areas that seek to achieve sustainable development through urban growth.

Presenter:

Khadija Salim Al Yarubi

University of Nizwa, Oman



What Are Our Duties to Mitigate the Climate Crisis?

Mehmet Özçelik

Faculty of Engineering, Van Yuzuncu Yil University, Turkey

Hello everyone. First, I would like to thank the organizing committee for inviting me as a guest speaker. I wish all participants a productive congress.

It is well known that the climate crisis is growing and global warming has become a critical issue. We can rapidly reduce our carbon footprint by optimizing energy consumption in our living spaces. Simple steps like improving building insulation, choosing A+++ energy-efficient appliance, and conserving water are vital. We must transition from the 'produce-consume-discard' model to 'reduce-reuse-recycle' and expand the 'Zero Waste' project globally. Prioritizing repair over replacement and minimizing single-use plastics are essential cultural shifts.

Food waste accounts for nearly 10% of global emissions; buying only what we need and choosing seasonal, local, and plant-based foods can create a massive impact. Furthermore, optimizing transportation by using public transit, cycling, or choosing low-emission vehicles significantly lowers greenhouse gases. While individual efforts are precious, change becomes revolutionary when collective. We don't need one person practicing zero waste perfectly; we need millions doing it imperfectly.

In my recent study, "Assessment of the Usability of Low-GWP Blended Refrigerants for Water-Source Heat Pumps," I theoretically investigated new alternative blends. We aimed for both environmental sustainability and high COP values using low-GWP refrigerants. I believe this work will guide future research. Engineers and researchers in the fields of Energy and Thermodynamics must advocate for eco-friendly fluids in heating and cooling systems. Moreover, we must encourage the transition from fossil fuels to clean sources like solar and wind power.

Thank you once again for this invitation. It is an honor to be here.

Presenter:

Mehmet Özçelik

Van Yuzuncu Yil University, Turkey



Climate Change Addressing through Green Technology and Environmental Policy Instruments: An Economic Perspective and Implications for Recycling

Burçin Çakır Gündoğdu

Center for Economic Policy Research and Practice, Istanbul
Gelism University, Turkey

The literature on climate change documents a wide range of adverse effects, including rising average temperatures, more frequent extreme weather events, melting glaciers, sea-level rise, and the degradation of agricultural land and water resources. Beyond these physical impacts, climate change also places increasing pressure on economic and environmental systems through the growing volume of waste generated by production and consumption processes. In this context, recycling plays an important role in climate change mitigation by reducing natural resource use, improving energy efficiency, and lowering greenhouse gas emissions. Technological innovation, particularly through green technology patents, enhances the efficiency of recycling processes and supports the diffusion of cleaner production methods. At the same time, international trade in environmental goods and technologies facilitates the transition toward low-carbon production structures, while environmental taxes discourage waste generation and environmentally harmful activities, promoting more sustainable production and consumption patterns.

This study examines the role of green technological innovation, environmental trade, and environmental taxes in mitigating climate change using a panel of OECD countries over the period 1995–2020. Green technology patents, trade in environmental goods and services, and environmental taxes are included as key explanatory variables, while greenhouse gas emissions are used as an indicator of environmental pressure. Panel data econometric techniques are employed to analyze long-run relationships and causal linkages. The findings reveal that green technology patents and environmental trade significantly reduce emissions, while environmental taxes act as a complementary policy tool. Overall, the results highlight the importance of an integrated policy framework that combines innovation, trade, and environmental taxation to enhance climate change mitigation efforts.

Presenter:

Burçin Çakır Gündoğdu

Istanbul Gelism University, Türkiye



Biomass Waste Valorization Pathways for Sustainable Energy and Climate Action: Systematic Review

Benjamin Yennuna Konyannik^{1,2}, Jerome Dela Lavie², Meisam Zargar¹ and Maryam Bayat¹

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Agricultural residues represent a vast, underutilized feedstock for renewable energy generation, offering a critical pathway toward climate mitigation and circular bioeconomy development. This systematic review critically evaluates current valorization techniques for agricultural biomass waste, assessing their energy conversion efficiency, environmental sustainability, and techno-economic viability. Following PRISMA guidelines, 78 peer-reviewed studies (2000-2025) were synthesized across thermochemical (pyrolysis, gasification), biochemical (anaerobic digestion, fermentation), and hybrid catalytic systems. Results indicate that optimized pyrolysis and anaerobic digestion yield the highest energy outputs from crop residues, with greenhouse gas emissions reduced by up to 60% compared to conventional fossil fuels. However, widespread agricultural adoption is constrained by feedstock heterogeneity, inconsistent pre-treatment protocols, and fragmented life cycle assessment (LCA) methodologies. Economic analysis reveals capital costs ranging from \$3M (fermentation) to \$10M (incineration), with payback periods of 4-8 years, heavily influenced by regional policy incentives and supply chain logistics. The review identifies critical research gaps, including the lack of standardized environmental impact frameworks for farm-scale systems, limited integration of AI-driven process optimization, and insufficient scalability data for smallholder agricultural contexts. We propose actionable recommendations for harmonizing LCA protocols, deploying low-cost pre-treatment technologies, and leveraging hybrid bioenergy systems to enhance rural energy resilience. These findings provide policymakers and agricultural engineers with evidence-based strategies to transform crop waste into sustainable energy vectors, directly supporting global climate targets and sustainable agricultural intensification.

Supplementary Materials

Results:

Biomass Feedstock

The studies examined in this review utilized a diverse range of biomass

feedstock types, including agricultural residues (e.g., sugars, starch, oil seed crops), forestry waste (e.g., wood chips, sawdust), industrial biomass by-products (e.g., bagasse, pulp, and paper mill sludge), and municipal solid waste (e.g., food waste, yard trimmings) (Table 1). As noted by previous researchers, the variety of feedstocks employed in these studies underscores the flexibility and adaptability of biomass waste valorization techniques, as well as their potential to utilize a broad spectrum of organic waste materials.

Table 1. Biomass type according to origin

Category		Representative Material
Agriculture	Sugars	Sugarcane, corn, sweet sorghum
	Starch	Maize, cassava, sweet potato
	Oilseed crops	Rapeseed, palm oil, <i>Jatropha</i> , soybean, mustards, sunflower, coconut
Lignocellulosic plants, short rotation coppice	Tropical grasses	Poplar, sycamore, switchgrass, <i>Miscanthus</i> , alfalfa, Altai wildrye, sweet clover
	Industrial residues and waste	Straw, bagasse, husks, shells, wood shavings, sawdust, fiber sludge, brewery by-products, oil extraction meal, cross-cut ends, plywood by-products
	Agricultural & forestry residues	Stumps, whole tree, bark, shrubs, slabs, logging by-products, dung, manure, poultry waste
Organic residues and waste	Municipal waste	Slaughterhouse byproducts, kitchen waste, biosludge

Economic Feasibility: The studies provided detailed insights into the cost structure linked to various valorization techniques, including capital investment, operational costs, and potential revenue from energy products and by-products (Table 2). Thermal processes, especially gasification, often require significant upfront investments, which can be a barrier for some stakeholders. However, these processes can deliver long-term economic benefits through high energy yields and the use of valuable by-products. The economic feasibility of hybrid systems depends on the complexity of integration and higher initial costs. Nonetheless, new catalysts can improve feasibility by boosting process efficiency, product yields, and cutting operational costs, thereby increasing revenue through optimized reaction conditions

and product selectivity. Notably, biological processes like anaerobic digestion generally need lower capital investment, but their economic viability relies heavily on managing feedstock quality and process parameters carefully. The economic viability of biomass waste valorization is shaped by many factors, including feedstock type and quality, process efficiency, and market demand for energy products and by-products.

Table 2. Economic viability and cost analysis

Valorization Technique	Capital Cost (USD)	Operational Cost (USD/ year)	Payback Period (years)	Barriers to Scale
Anaerobic digestion	50,00,000	5,00,000	5	Feedstock variability, biogas quality control
Incineration	1,00,00,000	10,00,000	8	High capital costs, air pollution control
Pyrolysis	70,00,000	7,00,000	6	Feedstock preparation, product quality control
Fermentation	30,00,000	3,00,000	4	Seasonal fluctuations in raw materials, contamination risk
Hybrid Systems	8,000,000 - 12,000,000	800,000 - 1,200,000	5-7	Integration complexity, higher upfront costs, optimizing synergies between technologies
Novel Catalysts	Research and Development phase	Variable, dependent on catalyst lifespan and efficiency	Potentially shorter with optimized performance	Scalability, cost-effectiveness, catalyst stability and regeneration

Challenges and Opportunities: For example, the European Union's primary energy consumption has undergone significant changes from 1990 to 2020. According to Figure 1, energy consumption peaked in 2005, with a 15.1% increase from the baseline target. However, since then, it has generally trended downward, with some notable decreases and minor increases. As at 2020, the EU's energy consumption was 3.0% above the target set for that year. Despite

the progress made, the EU still needs to reduce its energy consumption to meet its 2030 target. The blue marker on the graph indicates that a further reduction of 19.9% is required to achieve this goal. This highlights the remaining efforts needed by the EU to reduce its energy consumption and meet its targets. Figure 1 provides a visual representation of the EU's progress and challenges in reducing its energy consumption. It shows that while the EU has made some progress, more needs to be done to achieve its goals. The 2030 target requires a significant reduction in energy consumption, and the EU will need to implement policies and measures to achieve this reduction.

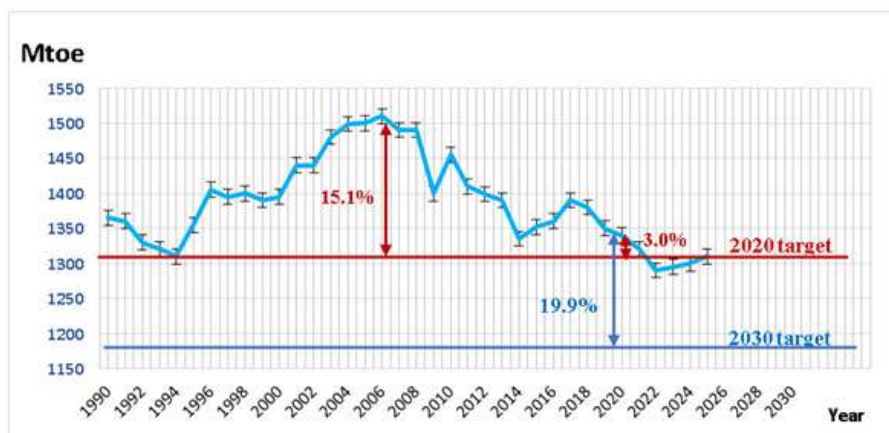


Figure-1: Primary Energy consumption in the European Union, distance to 2020 and 2030 targets (from ec.europa.eu/eurostat)

Conclusion: Recent advancements in biomass waste valorization techniques have led to the development of more efficient and sustainable processes. Hybrid systems, which combine different conversion technologies, have gained significant attention in recent years. These systems can optimize energy production, reduce waste, and increase the overall efficiency of the valorization process. Additionally, the development of novel catalysts has improved the efficiency and selectivity of various conversion processes, enabling the production of high-value products from biomass waste.

Presenter:

Benjamin Yennuna Konyannik

RUDN University, Russia

Kwame Nkrumah University of Science and Technology, Ghana



The Ocean Wave 1449: Your Server Down

Mohamed Bobo Diallo^{1,2}

¹UFHB Cocody, Côte d'Ivoire

²ICN Afrika 1449, Côte d'Ivoire

Two years from now, the continents may shrink, that, arctic polar ices melting as sea level rise of mixed cold and hot salty water intruding soil collapses perturbations. Have you modeled that France may be three hundred meters lower than sea levels, complicated that the antarctica collapses completely every inch of ice in the connected oceans, and USA Florida same wise ?

Have you evoked to trenders that 1000 years of stability ain't mean, you are further blessed and that rather, you may have benefitted that what have anteriorly faithfulness and truthfulness impetus to the Lord, that spare us extinctions in the space every probability ? Even an inclination of the earth axis made the Sahara a desert, maply, that it have inner oceans below; streaming to the connected oceans.

That have 1449h, is that 2027g, your servers may be down, so what have you spared for that digital winter expected: that the earth map without doubt will be shrunked by the oceans, of deterministically eschatologic new superficies, rescued that have statistical mathematics central limit analogy to its unknown posteriori patterns ?

So, are you already backing on USB keys behind your connected TV already, or your city spying righteously our shared research agenda, is already indexing and caching for universal telecommunications services, even when four-lane lambda can't afford the Internet access fees.

Presenter:

Diallo Mohamed Bobo

UFHB Cocody, Côte d'Ivoire

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Effects of Geological Structures on Groundwater Geochemistry and Groundwater Flow within Deep Basement Aquifers of Lilongwe, Malawi

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The study examines role of geological structures in controlling groundwater chemistry and flow within deep basement aquifers of Lilongwe using a quantitative experimental design. Groundwater samples were collected from 21 deep wells and 50 shallow wells following APHA (2017) and Malawi Standard MS 682–11:2012 protocols, with hydrogeological parameters such as borehole yield, water strike depth, and static water level recorded. Lithological data obtained from rock chips at 1 m intervals and logged using Rockworks 17, spatial maps were prepared in ArcGIS v10.5 using the Inverse Distance Weighted (IDW) method. Lineaments delineated using LANDSAT ETM imagery processed in PCI Geomatica, and statistical analysis conducted in IBM SPSS 25.0 with Principal Component Analysis (PCA). Results revealed five principal components explaining 80.31% of the variance: PC1 (38.4%) showed strong positive loadings in EC, TDS (ranging from <1000 mg/L in recharge zones to >2500 mg/L in fault-influenced zones), HCO_3^- , Cl^- , SO_4^{2-} , Na^+ , Ca^{2+} , and Mg^{2+} , reflecting dissolution from rock–water interactions; PC2 (14.3%) indicated deep-seated fault influence through positive SO_4^{2-} and negative Cd^{2+} loadings; PC3 (11%) highlighted Fe^{2+} and Mn^{2+} linked to evaporation and regional flow; PC4 (10%) showed carbonate dissolution (CO_3^{2-} , pH); and PC5 (6.66%) reflected minor water–rock interactions *via* F. Hydrochemical facies included Ca- HCO_3 , Ca + Mg- SO_4 , Na + K- HCO_3 , and Ca- SO_4 types, with Ca- HCO_3 dominant, consistent with active recharge and low TDS. Spatially, Ca- SO_4 and Ca-Mg- SO_4 types were confined to central and northern zones, Na + K- HCO_3 occurred in northern and southern zones, and Ca- HCO_3 varied along SE–NW trending faults. Groundwater flow systems were classified as local, intermediate, and regional, with fractures controlling recharge and flow pathways. Findings demonstrate geological structures significantly influence on groundwater geochemistry and flow, providing essential in-

sights for policymakers to design sustainable groundwater abstraction and management strategies within basement aquifers.

Presenter:

Daniel Kilembe

Mzuzu University, Malawi



Advances in Sustainable Pavement Subgrade Stabilization: A Review of Biopolymer- Natural Fiber Reinforcement of Clayey Soils

Michael Chizobam Uwaezuoke¹, Chijioke Christopher Ikeagwuani² and Fidelis Onyebuchi Okafor²

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²Department of Civil Engineering, University of Nigeria, Nigeria

The increasing demand for durable, environmentally sustainable pavement infrastructure has intensified interest in biopolymer-based soil stabilization and natural-fibre reinforcement as alternatives to conventional chemical stabilizers. This review aims to critically evaluate the effectiveness of integrating natural fibres with biopolymers for improving the engineering performance and long-term durability of clayey subgrades. The review specifically examines the mechanisms and synergistic effects of biopolymers and natural fibres on strength, stiffness, crack resistance, moisture susceptibility, deformation behaviour, and durability, while also assessing the influence of material type, dosage, fibre characteristics, curing conditions, and environmental exposure. A comprehensive literature review was undertaken by synthesizing findings from published experimental and review studies on biopolymer-stabilized and fibre-reinforced clayey soils. Comparative analysis was used to identify performance trends, advantages, limitations, and critical knowledge gaps relevant to pavement applications. The reviewed evidence indicates that biopolymers improve soil bonding and particle interaction, while natural fibres provide tensile bridging, crack-control mechanisms, and enhanced resistance to deformation. Their combined application generally produces greater improvements in strength retention, stiffness, crack resistance, and durability than either treatment used independently, although performance depends strongly on biopolymer chemistry, fibre properties, dosage, soil mineralogy, and curing or environmental conditions. The hybrid approach also offers sustainability benefits through the use of renewable materials, reduced dependence on energy-intensive chemical stabilizers, and potential reductions in environmental impacts. The review concludes that biopolymer–natural-fibre stabilization is a promising strategy for sustainable clayey subgrade improvement. However, standardized testing protocols, long-term field validation, durability assessment under realistic environmental conditions, and dosage optimization remain necessary to support reliable engineering design and large-scale implementation.

Presenter:

Michael Chizobam Uwaezuoke

University of Agriculture and Environmental Sciences, Nigeria



The Stories of Ailing Forest Reserves and Standpoints of Agrarian Landowners: Kumbo and Lambo Reserves in Perspectives

Yamboar Laarbik¹, Aboagye Dacosta², Owuse-Sekyere Ebenezer³ and Dakurah George²

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³Department of Environment and Sustainability Sciences, University for Development Studies, Ghana

Forest covers across the globe continue deteriorate with worsening situations occurring in developing nations. Deprived ecological regions like Ghana suffer neglect, while rural forest landscapes like Kumbo and Lambo Forest Reserves heavily undergoing vegetation losses in a continuum. This paper examined the trends and hotspots of land use/cover changes in the Kumbo and Lambo Forest Reserves, Ghana, over the period 2002 to 2022, analyzed their consequences for forest resilience, and assessed landowners' perception of ongoing changes amidst their interest as farmers. Landsat 7 TM was derived from the US Geographic Survey website to generate images and later statistics to classify and calculate changes in the land cover types. It also used focus group discussions to seek the worldviews of landowners on the perceived LULC changes in the reserves. The results showed a forest cover rise between 2002 and 2012 from 70% to 81.5% within Kumbo Reserve, which dropped sharply to 45.11% by 2022, while bareground expanded by 57.09 km². These findings highlight significant hotspots and renewed agricultural encroachment, while Lambo Reserve showed more stable forest gains and limited bare ground expansion, indicating stronger community-supported resilience. Chi-square analysis confirmed the statistical significance of LULC changes, pointing to substantial threats to ecosystem stability. The results attributed the initial growth to Modified Taungya System project introduced in 2006. The local values proved favorable to forest growth, but not when the lives of landowners are threatened by farmland shortages. The study recommends for mainstreaming of local ideas in forest management projects in the areas.

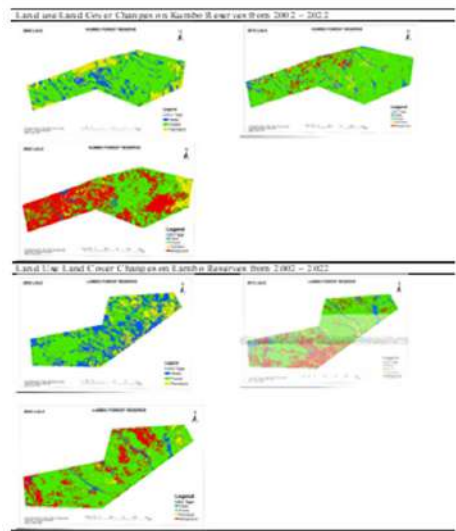


Table 1: Nature of LULC Changes in Kumbo Forest Reserve
Source: (Field data 2023)

Year		Kumbo Forest Reserve				Total
		water	Forest	Farm land	Bareground	
Area (2002)	SQR KM	19.51	88.76	18.98	0.00	127.25
	Percent	15.33	69.75	14.91	0	100
Area (2012)	SQR KM	7.56	103.76	7.14	8.85	127.31
	Percent	5.94	81.5	5.61	6.95	100
Area (2022)	SQR KM	1.15	57.42	11.63	57.09	127.29
	Percent	0.9	45.11	9.14	44.85	100

Table 2: Nature of LULC Changes in Lambo Reserve (Source: Field data 2023)

Year	Lambo Forest Reserve					
	Water	Forest	Farmland	Bareground	Total	
Area (2002)	SQR KM	40.65	69.02	19.77	0.00	129.41
	Percent	31.41	53.33	15.28	0	100
Area (2012)	SQR KM	7.94	85.42	6.10	29.89	129.35
	Percent	6.14	66.04	4.72	23.11	100
Area (2022)	SQR KM	5.01	94.77	3.70	25.86	129.37
	Percent	3.88	73.26	2.86	20	100

Presenter:
Yamboar Laarbik
E. P. College of Education, Ghana



Who Must We Become? Climate Education, Identity and the Relational Turn

Naida Culshaw

Independent Scholar-Practitioner, UK

Climate change is not only a scientific, technological or behavioural challenge; it also unsettles assumptions about progress, responsibility and humanity's relationship with the living world. This presentation asks what climate education might become if it addressed not only what people need to know and do, but also who they are becoming and what they understand themselves to be responsible to.

The presentation brings two related qualitative inquiries into conversation. The first is doctoral research examining how learning experiences infused with Indigenous worldviews shaped entrepreneurial identity across three international programmes. The study drew on 23 conversational participant interviews, alongside conversations with culture carriers, Elders and programme designers, using abductive thematic analysis within a relationally accountable Indigenous/ous/ist research orientation.

Across the study, learning involved more than knowledge acquisition: participants reworked identity through memory and ancestry, reconnected with community, land, spirit and more-than-human worlds, and carried these shifts into purpose, practice and contribution. The second inquiry draws on the co-authored case study of Gaia Ashram and Lazyman Coffee in Thailand. Repeated semi-structured interviews and iterative cross-case qualitative analysis examined how Indigenous values shaped entrepreneurial journeys and venture design. Across both cases, enterprise emerges as a vehicle for cultural continuity, community livelihood, ecological stewardship and inter-generational responsibility.

Together, these findings suggest a relational turn in climate education: moving beyond sustainability knowledge to consider how education and regenerative enterprise can become sites in which identity, values and ecological responsibility are reconsidered through relationship with community, culture, land and place. Climate education for regenerative futures therefore

asks not only what people know or do, but who they are becoming, what they are responsible to, and how that responsibility is lived.

Presenter:

Naida Culshaw

Independent Scholar-Practitioner, UK



Valorization of Water Lettuce (*Pistia stratiotes* L.) Through Bioconversion for Black Soldier Fly Larvae (*Hermetia illucens*): Larvae Growth, Survival Rate and Nutritional Quality

Farokh Niass¹, Juste Vital Vodounnou², Romaric Iko^{2,3}, Rendani Luthada-Raswiswi⁴, Cayen Sédro Alofa⁵, Gildas Djidohokpin^{5,6}, Sèlomè Wilfried Sintondji⁵ and Jean-Claude Micha⁷

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The rapid proliferation of water lettuce, *Pistia stratiotes*, poses significant ecological challenges. This study investigates the use of *Pistia stratiotes* as a substrate for producing black soldier fly larvae. The experiment used 40 g of black soldier fly larvae (BSFL) pupae for all five substrates (T0, T25, T50, T75, and T100). Each treatment had three replicates. The physicochemical parameters, such as the temperature and pH, ranged from 27.30°C to 27.40 °C and from 7.03 to 7.60, respectively. The survival rates ranged from 90.13% to 94.73%. The biochemical parameters showed significant differences, including dry matter, organic matter, ash, crude protein, crude lipid, crude fiber, carbohydrate, and energy ($p < 0.05$). Regarding the larvae's growth and substrate use, the BSFL production varied depending on the rearing substrate. The highest growth was observed in substrates without water lettuce leaf (WLL) (T0), followed by those in treatment at 25% (T25) and 50% (T50) inclusion of WLL and then the substrate made solely of WLL (T100). The

substrates degradation rate in this study varied significantly, ranging from 46.40% to 67.38%. The physicochemical characteristics of the substrates are associated with the growth performance of the BSFL, and the inclusion of WLL influenced the nutritional composition of the larvae.

Presenter:

Farokh NIASS

Gaston Berger University, Senegal



Using Inverse Seismology to Better Constrain High Impact, Low Probability (HILP) Seismic Hazard Estimates

Carlos Sousa Oliveira

Instituto Superior Tecnico, Universidade Lisboa, Portugal

When attempting to extrapolate results derived from instrumental data (typically spanning only a few decades) to much longer return periods (on the order of centuries or more), any high-quality information characterizing the seismic input becomes extremely valuable, as it provides essential constraints on this extrapolation. This need is equally relevant today in regions with sparse or absent seismic instrumentation.

We have examined several case studies in which detailed damage information is available for relatively simple structures subjected to unknown ground motion. For structures that behave as, or can be reasonably idealized as, single-degree-of-freedom (SDOF) systems, it has been possible to derive uncertainty intervals with relatively narrow bounds. Examples include statues, chimneys, towers, lighting pylons, suspended elements, slender structural components, water tanks, as well as sloshing effects in rivers and reservoirs. By formulating and solving an inverse problem, the corresponding seismic input can be inferred.

Arche-seismology and arche-tsunami provide additional opportunities to observe analogous phenomena over timescales extending back centuries or even a few thousands of years. To illustrate the proposed methodology, we present two representative applications in which we successfully obtained meaningful constraints on the seismic input, thereby improving the estimates required for addressing high-impact, low-probability (HILP) problems.

Presenter:

Carlos Sousa Oliveira

Universidade Lisboa, Portugal



Providing the Grounds and Directions for a Randomized Controlled Trial Reducing Diagnosis Uncertainty in Psychiatric Symptomatology Related To Inhaled Pollutants – As Legitimized by the Precautionary Environmental Principle

Ana Rodriguez

Centre for the Studies of Population, Economy and Society,
Portugal

Regulatory interventions addressing air pollution have been a vital part of climate change agenda and environmental agreements. Evidence on mental health effects of air contamination is robust while self-reported physical stress symptoms have been observed in adolescents exposed to short-term ultrafine particles (UFP) contamination. Plausible pathways pointed to the activation of neuroendocrine stress response involving hypothalamus-pituitary-adrenal and sympathetic-adrenal – medullary axes as the underlying mechanisms of air pollution health effects. A randomized controlled trial is designed aiming to determine the relevance of the Dexamethasone Suppression as a Measure of Feedback Negativity (Dex-test) as a biological criterion in depressive disorders involving neuroendocrine disturbance in relation to air pollution-induced stress response in 46 healthy adolescents at High School settings. The intervention model consists of a parallel assignment using an enrolment ratio of 1:1 and a pre-test to verify the equivalence between conditions of high and low atmospheric pollution in baseline cortisol levels, stress task performance, Dex-test incidences and levels of psychiatric symptomatology. Anxiety and depressive symptoms (Hamilton Scale), self-reported physical and psychological stress symptoms, and clinical diagnosis of anxiety and depressive disorders – Prime-MD, Patient Health Questionnaire screening, antidepressants use, and GP's medical evaluation would be the main outcomes assessed. Levels of inhaled pollutants toxicity will be set considering pollutants exposure-response relationship targeting UFP/Particulate Matter discriminant health effects. This study is believed to provide evidence of a biological diagnostic criterion suggestive of depression involving neuroendocrine disturbance induced by inhaled pollutants exposure while sustaining previous assumptions on mental health effects of air pollution plausibly modulated by neuroendocrine activation. The findings of this research would have clinical implications for the diagnosis criteria of depressive disorders accounting for the proportionated risks attributed to

environmental factors further informing public health policies and recommendations on indoors air quality guidelines applied to school settings.

Presenter:

Ana Rodriguez

Centre for the Studies of Population, Economy and Society, Portugal



Servitization as a Circular Economy Strategy for Climate Change Mitigation: Evidence from a Brazilian Packaging Company

Heloisa Candia Hollnagel^{1, 2}, Alexandre Fernandes Andrade¹ and Fernando de Almeida Santos¹

¹Pontifical Catholic University of São Paulo (PUC-SP), Brazil

²Universidade Federal de São Paulo (UNIFESP), Brazil

The transition toward Circular Economy (CE) has become an essential strategy for reducing environmental impacts, increasing resource efficiency, and supporting climate change mitigation. Nevertheless, many small and medium-sized enterprises (SMEs), particularly in emerging economies, still face challenges in incorporating circular practices into their business models. This study investigates how servitization can facilitate the transition from a traditional linear business model to a circular economy model in a Brazilian tertiary packaging company operating in logistics and transportation. The research adopted a qualitative participatory case study approach based on semi-structured interviews, direct observation, document analysis, and the application of Weetman's Circular Economy Framework combined with the Circular Business Model Canvas (CBMC). The findings indicate that servitization represents an effective pathway for improving environmental performance while simultaneously generating economic value. The proposed business model incorporates reverse logistics, product stewardship, environmental education, circular product design, eco-labels, sustainable partnerships, and digital technologies to improve resource efficiency throughout the value chain. The study also identifies organizational culture, leadership commitment, regulatory support, and employee engagement as critical enablers of circular transformation. The research contributes by proposing an expanded Circular Business Model Canvas adapted to the Brazilian regulatory context, integrating the National Solid Waste Policy, reverse logistics agreements, and sustainability accelerators. The framework offers practical guidance for organizations seeking to reduce waste generation, improve resource productivity, strengthen supply chain resilience, and contribute to the Sustainable Development Goals (particularly SDGs 9, 12, and 13). This research concludes that Servitization (as a circular economy strategy), environmental education, and innovation practices can help companies achieve greater financial performance in the packaging industry and contribute to SDG and 2030 Agenda achievements. This can be achieved by combining circular economy principles, servitization, environmental education, and

digital innovation to support sustainable industrial development and climate change mitigation in emerging economies.

Presenter:

Heloisa Candia Hollnagel

Pontifical Catholic University of São Paulo (PUC-SP), Brazil

Universidade Federal de São Paulo (UNIFESP), Brazil



Shifting Mindsets: A Path for Change Acceleration

Isabel Rimanoczy

Convener PRME Working Group on the Sustainability Mindset
USA

What motivates business leaders to champion sustainability initiatives, particularly when the context is averse to it? This question is of high relevance today, as social and environmental challenges persist despite widespread regulatory lack of attention, threatening our collective wellbeing and the health of the larger ecosystem on which we depend. It was also the research question posed by Dr. Rimanoczy in the early 2000s, in a qualitative exploratory study conducted at Teachers College, Columbia University. She interviewed seventeen business leaders that shifted from a conventional way of doing business to personally championing initiatives leading to positive social and/or environmental impact. Their initiatives transformed the culture and operations of their organizations, later becoming exemplary cases of CSR/sustainability-minded corporations.

The findings of the study revealed a set of characteristics of the thinking and being that played a central role in the engagement of the studied leaders. The aspects identified were not personality-based, but developable, and became known as the Sustainability Mindset Principles. The sustainability mindset is described as a way of analysing information and making decisions that includes systems thinking, an ecological worldview, as well as developable aspects pertaining to emotional and spiritual intelligence.

The twelve Sustainability Mindset Principles (SMP) have since been adopted by academic members of the UNPRME Working Group on the Sustainability Mindset, a network of scholars in 59 countries across +290 universities. The SMPs are a pedagogical scaffold to develop a sustainability mindset and are applicable across disciplines. They create a holistic mind shift, prompting sustainable behaviours from the inside out, both accelerating change and achieving lasting transformation. The SMPs are the conceptual framework of the Sustainability Mindset Indicator, an assessment that maps and profiles where an individual is on the journey of developing a mindset for sustainability. The indicator is used as a personal development and a research tool.

Presenter:

Isabel Rimanoczy

Convener PRME Working Group on the Sustainability Mindset, USA



Adoption of Blockchain Technology in Enhancing Supply Chain for Sustainable Practices: Case Study Review and Proposed Framework

Shazia Hassan

IEEE, USA

The integration of blockchain technology into supply chain management presents a transformative opportunity to enhance sustainability practices across various industries. This paper explores the multifaceted benefits of adopting blockchain as a foundational framework for supply chains, emphasizing its potential to improve transparency, traceability, and accountability. By providing an immutable ledger, blockchain enables stakeholders to track the provenance of goods, ensuring ethical sourcing and reducing fraud. Additionally, the decentralized nature of blockchain fosters collaboration among supply chain participants, facilitating the sharing of critical information that can lead to more efficient resource utilization and waste reduction. Through case studies and empirical analysis, this paper illustrates how blockchain can mitigate environmental impacts, promote social responsibility, and ultimately drive sustainable practices within supply chains. The findings underscore the necessity for organizations to embrace this innovative technology as a critical component in their sustainability strategies, paving the way for a more resilient and responsible future in global commerce.

Presenter:

Shazia Hassan

IEEE, USA



Improving Agricultural Resilience to Climate Change Communication Frameworks and Practices

B. Roseline Bayili

Communication PHD student, Laval University, Canada

In the Sahel, the contributions of climate change resilience communication efforts to mitigating the adverse effects of climate change on agriculture remain limited. They are not yet sufficient to secure the commitment of stakeholders and affected populations to climate change resilience and sustainable agricultural transformations. Scientific efforts toward climate resilience communication that contributes to agriculture's resilience to climate change should include the development of robust and specific approaches and methodologies that are more efficient. The aim of our paper is the AgriClimCom model, a new climate change resilience communication tool to innovate agricultural climate change resilience communication policies, practices, and solutions. It proposes methodological tools, information sets and communication frameworks for more relevant and efficient communication actions related to agricultural climate change resilience. The messages of such resilience communication actions integrate climate change impacts, agricultural vulnerability to climate change factors and the most appropriate local communication resources. The AgriClimCom model is a new tool for agricultural climate change resilience communication actions. It is guided by the contextual communication needs related to agricultural resilience and transformation, specifically in the Sahel region.

Presenter:

B. Roseline Bayili

Laval University, Canada



Interannual Variability of Dinoflagellates in the Northern Humboldt Current System (NHCS)

Maribel Baylón and **Max Galán**

Laboratorio de Ecología Molecular y Biodiversidad, Facultad de Ciencias Biológicas, Universidad Nacional Mayor de San Marcos, Peru

Dinoflagellates are a key phytoplankton group in the highly productive Northern Humboldt Current System (NHCS), where several species can form harmful algal blooms (HABs). This decade-long study (January 2010–August 2019) examined the interannual variability of dinoflagellate assemblages inside and outside Paracas Bay, Pisco (Peru), in relation to the El Niño–Southern Oscillation (ENSO) dynamic. A total of 1137 samples from 18 sites (10 inside the bay, 8 outside) were analyzed following the Utermöhl method, together with sea surface temperature (SST), the El Niño-Coastal Index (ICEN), nitrates and phosphates. Dinoflagellates were classified by feeding strategy and by Reynolds' C-S-R functional groups, and assemblage variability was assessed across ENSO phases (El Niño, La Niña, neutral, and El Niño-Coastal events) using an orthogonal two-track design with permutation-based multivariate analyses (PERMANOVA, PCO, SIMPER, BIO-ENV). We recorded 113 dinoflagellate taxa (7 orders, 19 families, 36 genera), representing 54% of the taxa documented in Peru, with *Protoperidinium* and *Tripos* as the most diverse genera. Assemblage structure, richness and abundance showed significant interannual variation across ENSO phases and between zones. Heterotrophic species with a pallium feeding mechanism (functional group S) thrived outside the bay during El Niño, under low nutrient availability, whereas mixotrophic species dominated inside the bay during El Niño-Coastal events associated with high SST. Inside Paracas Bay, interannual variability was significantly associated with ICEN and phosphate concentrations. These findings underscore the complex link between environmental variability and dinoflagellate dynamics, and the value of feeding-strategy diversity for understanding phytoplankton responses to the ENSO dynamic in this vital upwelling region.

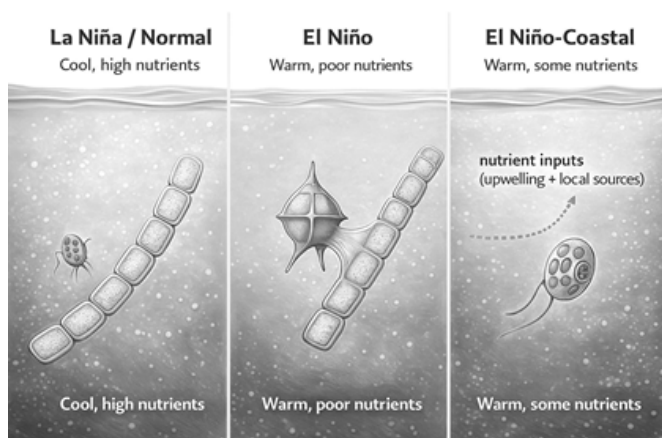


Figure 1: Conceptual response of dinoflagellate feeding strategies to the ENSO dynamic in the NHCS: diatom-favouring conditions under La Niña/neutral upwelling, heterotrophic (pallium-feeding) dinoflagellates under El Niño, and mixotrophic (often HAB-forming) dinoflagellates under El Niño-Coastal events. Own elaboration; based on results in Galán & Baylón (2025), *Estuaries and Coasts* 48:145.

Presenter:

Maribel Baylón

Universidad Nacional Mayor de San Marcos, Peru



Biomass Decomposition in Cacao-Based Agroforestry Systems

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¹Bajo Mira Cacao Company, Colombia

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³Independent Researcher, Colombia

Agroforestry systems enhance soil health and sustainability in tropical agriculture, yet nutrient dynamics in cacao-based systems remain underexplored. This study evaluated litter yield, decomposition rates, and nutrient release in three cacao (*Theobroma cacao* L.) agroforestry arrangements in Tumaco, Colombia, using a randomized block design over 150 days. Litter yield was highest in the *Cedrela odorata* and *T. cacao* system (12,040.08 kg/ha) and lowest in the *Carapa guianensis* and *T. cacao* (3279.84 kg/ha). Decomposition rates were highest for *C. guianensis* (67.5%), followed by *T. cacao* (64%) and *C. odorata* (59.8%). Nutrient release followed the sequence $Ca > N > Mg > K > P$. Agroforestry systems improve soil fertility but require integrated nutrient management to meet cacao's needs, contributing to sustainable agriculture aligned with SDG 2 and SDG 15.

Presenter:

Danny Daniela Guerrero Aguas

Bajo Mira Cacao Company, Colombia



Assessing Shrubland Productivity in Arid Ecosystems Using Multivariate Ecological Indicators

Martín Martínez-Salvador

Autonomous University of Chihuahua, Mexico

Traditional approaches for assessing site productivity in forest ecosystems are primarily based on modeling dominant height growth of key tree species, which serves as a proxy for stand productivity. However, in many arid and semi-arid ecosystems, such approaches are limited due to the lack of long-term growth data and the difficulty of estimating plant age. Additionally, many shrub species exhibit irregular growth patterns that are not adequately captured by height-based models alone. In this context, this study proposes an alternative multivariate approach for classifying site productivity based on structural and abundance-related variables of plant populations. Using *Agave lechuguilla* Torr as a model species, data were collected from 112 sampling plots in northern Mexico, including plant height, basal diameter, crown diameter, and abundance. An Importance Value Index (IVI) was used to define three site quality categories (low, medium, and high), followed by the application of classical discriminant analysis (CDA) to derive classification functions. The model achieved high classification accuracy (95.54%), with complete discrimination of extreme site categories. Complementary analyses (MANOVA and PCA) confirmed the robustness and ecological consistency of the proposed approach.

This methodology provides a practical and replicable framework for assessing productivity in shrub-dominated ecosystems, particularly where traditional forestry metrics are not applicable. It also offers valuable implications for sustainable management, conservation, and resource use in arid environments.

Presenter:

Martín Martínez-Salvador

Autonomous University of Chihuahua, Mexico



Probabilistic Seismic Hazard Analysis for El Salvador

Walter Salazar

Catholic University of El Salvador, El Salvador

I present a time-independent new probabilistic seismic hazard analysis (PSHA) for El Salvador regarding peak ground and spectral accelerations for 5% of critical damping at 0.2 and 1 s periods based on Salazar (2026, DOI: 10.1007/s10518-026-02394-z). Firstly, a new earthquake catalog is compiled regarding moment magnitude, covering historical and instrumental seismicity for 1528-2023. Secondly, I propose a multi-linear Gutenberg-Richter relationship and a constant bandwidth distance amongst epicenters for the upper-crustal volcanic chain seismicity. I use a three-dimensional geometry subduction zone in the analysis, considering the primary focal mechanism along the slab: thrust and normal faulting; the difference between reverse interface and reverse intraplate shocks is highlighted as a new component in the PSHA. Thirdly, I employ a logic tree formulation to threaten the epistemic uncertainty contrasting rigid-zone and free-zone methods deriving seismic hazard maps compatible with the American Society of Civil Engineers (ASCE) standards for rock site conditions with a V_{S30} of 760 m/s and flat topography setting 50, 95, 475, 975, and 2475 years of return period. In order to justify proper weighting in the logic tree, available ground motion prediction equations are tested with actual accelerometric data for moderate and destructive earthquakes in El Salvador. Finally, the PSHA results are contrasted with ground motion from rupture models employing preliminary geodetic data at some faults, the actual seismic loads prescribed in the regulations, and former research works.

Presenter:

Walter Mauricio Salazar Guerra

Catholic University of El Salvador, El Salvador

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