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2026



SEPTEMBER
24-25
LONDON, UK

5th Global Summit on

ADVANCES IN EARTH SCIENCE AND CLIMATE CHANGE

SCIENTIFIC PROGRAM

DAY 01
THURSDAY

SEPTEMBER 24, 2026

08:00-08:30	Registrations
08:30-08:40	Inaugural Ceremony
Moderator	Prasanna Gajanan Tillu , <i>Birla Institute of Technology and Science, India</i>
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	
Session Chair	Andrea Maria Calazans Pacheco Pacífico , <i>Paraíba State University, Brazil</i>
08:40-09:00	Title: Climate Change Displaced Persons' Governance in Latin America with a Focus on Brazil Andrea Maria Calazans Pacheco Pacífico , <i>Paraíba State University, Brazil</i>
09:00-09:20	Title: Bridging the Gap in Earthquake Prediction: Operational Forecasting via Multi-Sphere Data Integration Angelo De Santis , <i>Istituto Nazionale di Geofisica e Vulcanologia, Italy</i>
09:20-09:40	Title: Regionalization Approaches for the Spatial Analysis of Extremal Dependence with Applications in Climate Research Thorsten Dickhaus , <i>University of Bremen, Germany</i>
09:40-10:00	Title: Developing Integrated Hydrologic Modeling and Flood Mitigation Strategies for the Takwi Creek Watershed, Philippines Maria Cristina V. David , <i>Pampanga State Agricultural University, Philippines</i>

10:00-10:20	Title: Weathering the Storms: Climate Vulnerability and Consequential Impacts upon the Poor in the US Carol Camp Yeakey, <i>Washington University in St. Louis, USA</i>
GROUP PHOTO 10:20-10:30	
REFRESHMENT BREAK 10:30-10:50	
10:50-11:10	Title: Addressing Climate Change Challenges through Decarbonizing of India's Automotive Sector: An Optimal Fuel-Drive Mix Scenario for 2035 Prasanna Gajanan Tillu, <i>Birla Institute of Technology and Science, India</i>
11:10-11:30	Title: Waste-to-Hydrogen Conversion of Sugar Beet Pulp via Steam Gasification and MOF-Based CO₂ Separation Nezihe Ayas, <i>Eskisehir Technical University, Turkey</i>
11:30-11:50	Title: Integrating Climate and Sustainability Competencies into Textile Education through Micro-Credentials Ada Traumann, <i>TTK University of Applied Sciences, Estonia</i>
11:50-12:10	Title: Protected Areas and Community Based Conservation: Some Management Perspectives from the Southern Western Ghats in India Sugato Dutt, <i>Tamil Nadu Compensatory Afforestation Management Plan Authority, India</i>
12:10-12:30	Title: Unraveling Climate Change Vulnerabilities of Wetland Communities: Insights from <i>Hakaluki Haor</i> in Bangladesh Md Amdadul Haque, <i>Shahjalal University of Science and Technology, Bangladesh</i>
12:30-12:50	Title: Climate Change and Natural Disasters: Examining the Psychosocial Issues that Impact Female-Headed Households Post-Hurricane Maria in Dominica Debra D. Joseph, <i>The University of the West Indies, Cave Hill, Barbados</i>
GROUP PHOTO 12:50-13:00	

LUNCH BREAK 13:00-13:40

Session Chair	Juergen Reichardt , MSA Muenster School of Architecture, University of Applied Sciences, Germany
13:40-14:00	Title: Biogeotechnics: Study of Root-Reinforcement in Strengthening the Soil D. Ashwini, Maharaja Institute of Technology Mysore, Visvesvaraya Technological University, Belgaum, Karnataka, India
14:00-14:20	Title: Assessment of Circularity and Minimization of CO₂ Emissions in the Overall Industrial Construction System – The Path to a Sustainable Transformation along the Value Chain: Case Study of a Building Assessment with Madaster Juergen Reichardt, MSA Muenster School of Architecture, University of Applied Sciences, Germany
14:20-14:40	Title: Improving TiO₂ Photocatalytic Performance in Water Hydrolysis: A DFT Study Emine Esra KASAPBASI, Beykoz University, Turkey
14:40-15:00	Title: Salt Tolerant Halophyte Plants under Global Climate Change. Why their Roots Grow Faster under Rising Salinity? Vadim Volkov, K.A. Timiriazov Institute of Plant Physiology, Russian Academy of Sciences, Russian Federation
15:00-15:20	Title: Evaluating Concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂, CO, O₃, and H₂S Emitted by Artisanal Brick Kilns in Juliaca, Peru, Using a Low-Cost Sensor Network and AERMOD Model Jose Luis Pineda Tapia, Universidad Nacional de Juliaca, Peru
15:20-15:40	Title: Rare Earth Elements: A Review of Primary Sources, Applications, Business Investment, and Characterization Techniques Lílian Lefol Nani Guarieiro, University SENAI CIMATEC, Instituto Nacional de Ciência e Tecnologia em Energia e Ambiente – INCT, Brazil

15:40-16:00	Title: Novel Concept and Technologies of Sustainable Building Design Juergen Reichardt, MSA Muenster School of Architecture, University of Applied Sciences, Germany
REFRESHMENT BREAK 16:00-16:15	
16:15-16:30	Title: An Investigation of the Dynamic Behaviour of Offshore Wind Turbine Support Structures in Harsh Norwegian Marine Environments Giancarlo Angelopoulos, City St. George's University, UK
16:30-16:50	Title: Upcycling Post Consumer Textile Waste by Enabling Local Marginalized Community Development through Cloud-fulfilment Ecosystem Richa Sharma, National Institute of Fashion Technology Bengaluru, India
16:50-17:10	Title: Generation of Monthly Streamflows in the Ica River Basin up to the La Achirana Hydrometric Station Using the GR4J Rainfall-Runoff Model Angel Gabriel Ochante Sanchez, Universidad Privada del Norte, Peru
17:10-17:30	Title: Spatio-Temporal Analysis of Land Use/Land Cover Changes: Implications of Climate Variability in Gicumbi District, Rwanda (1995–2025) Angela Oyilieze Akanwa, University of Technology and Arts of Byumba (UTAB), Rwanda Chukwuemeka Odumegwu Ojukwu University (COOU), Nigeria
17:30-17:45	Title: Energy-Efficient Autonomous Harvesting for Sustainable Vertical Farms Using Mobile Manipulators Priyanka Verma, Indian Institute of Technology Ropar, India

17:45-18:05 Title: Effects of Heat Treatment on Plasma-Sprayed Indian Clam Seashell-Derived Hydroxyapatite (HA) Coating Applied on Ti-Alloy

Kazi Sabiruddin, *Indian Institute of Technology Indore (IIT Indore), India*

18:05-18:25 Title: Building Smart Circular Economies through Industry 4.0 Technologies: Evidence from South Asia

Narayanage Jayantha Dewasiri, *Sabaragamuwa University of Sri Lanka, Sri Lanka | University Centre for Research and Development (UCRD), Chandigarh University, India*

18:25-18:45 Title: Reverse Logistics and Environmental Sustainability of Fast-Moving Consumer Goods Companies in Nigeria

Jude Chekwume Nwaulune, *Babcock University Nigeria*

18:45-19:05 Title: Multi-Sensor Earth Observation for Remote Large Eruption Monitoring: The 2025 Erta Ale–Hayli Gubbi Eruption (Ethiopia)

Maria A. Marsella, *Sapienza University of Roma, Italy*

END OF DAY-1

SCIENTIFIC PROGRAM

DAY 02

FRIDAY

SEPTEMBER 25, 2026

08:30-08:40	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 Geoengineering	
Distinguished Speaker Talks	
Session Chair	Adrian Wolfberg, Case Western Reserve University, USA
Session Chair	S. B. Yogananda, University of Agricultural Sciences, Mandya, India
Session Chair	Nezihe Ayas, Eskisehir Technical University, Turkey
08:40-09:00	Title: When the Frame No Longer Fits: Learning to Adapt in Climate and Earth Science Decisions Adrian Wolfberg, Case Western Reserve University, USA
09:00-09:20	Title: Hydrogen-Based <i>In-Situ</i> Reduction of Pyrite Cinder for Iron Recovery Yongliang Wang, University of Emergency Management, China
09:20-09:40	Title: Balancing Tourism Expansion and Ecosystem Sustainability: Experiences from Goa's Coastal Destinations (India) Nandkumar Sawant, Parvatibai Chowgule College (Autonomous), India
09:40-10:00	Title: Advances in Soil Carbon Monitoring and Management: Tools and Strategies for Climate-Smart and Sustainable Agriculture S. B. Yogananda, University of Agricultural Sciences, Mandya, India

10:00-10:20	Title: Integrating GIS and Remote Sensing for Spatial Distribution Assessment of Drought Vulnerability Index Jehan Momammed Sheikh Suleimany, <i>Salahaddin University, Iraq</i>
GROUP PHOTO 10:20-10:30	
REFRESHMENT BREAK 10:30-10:50	
10:50-11:10	Title: Assessing the Systemic Effects of the Bordeaux Low Emission Zone (LEZ) Using the SIMUTEC Platform Seghir Zerguini, <i>Bordeaux School of Economics (BSE) - University of Bordeaux, France</i>
11:10-11:30	Title: Influence of Ageing and Siltation on the Seismic Responses of Arch Dams Deepa Balakrishnan S, <i>Cochin University of Science and Technology, India</i>
11:30-11:50	Title: A Simple Overview of Virtual Machine (VM) Consolidation Techniques for Green Cloud Computing Mamatha G S, <i>RV. College of Engineering, India</i>
11:50-12:10	Title: Packaging Industry in India – A Paradigm Shift towards Sustainability Smita Salunke, <i>Akbar Peerbhoy College of Commerce & Economics, India</i>
12:10-12:30	Title: Sound Insulation and Mechanical Characterization of Recycled Rubber Panels for Sustainable Building Applications Anđelko Crnoja, <i>University North, Croatia</i>
12:30-12:50	Title: Seismic Risk in the Chlef Region: Evaluation of Road Network Risk Interruption Zohra BOUTARAA, <i>Hassiba Benbouali University of Chlef, Algeria</i>
GROUP PHOTO 12:50-13:00	
LUNCH BREAK 13:00-13:40	

Session Chair	Adrian Wolfberg , <i>Case Western Reserve University, USA</i>
Session Chair	S. B. Yogananda , <i>University of Agricultural Sciences, Mandya, India</i>
Session Chair	Nezihe Ayas , <i>Eskisehir Technical University, Turkey</i>
13:40-14:00	Title: Techno-Economic Analysis of Bio-Solar Green Roofs for Urban Heat Island Mitigation and Building Energy Performance in Pakistan Azhar Iqbal, <i>University of Gujrat, Pakistan</i>
14:00-14:20	Title: Curriculum Design and the Integration of Sustainability - The Case of Reorganized Master Programs Martin Wenke, <i>Hochschule Niederrhein University of Applied Sciences, Germany</i>
14:20-14:40	Title: From Surplus Power Valorization to Hydrogen-Based Turbine Decarbonization in Industrial Gas Turbogenerators Juan Fernando Cadavid Montoya, <i>Universidad de Santander (UDES), New Technologies Research Group (GNT), Colombia</i>
14:40-15:00	Title: Keto-enol Insecticides Disrupt Ovarian Wnt/Armadillo Signaling and Redox Balance, Inducing Generational Toxicity in <i>Drosophila melanogaster</i> María Elena Calderón-Segura, <i>Institute of Atmospheric Sciences and Climate Change, Universidad Nacional Autónoma de México, Mexico</i>
15:00-15:20	Title: Study of Groundwater Quality and its Human Health Risk Assessment to Population Exposed in the Region of Nimar, Madhya Pradesh, India Devaanshi Jagwani, <i>IPS Academy, Institute of Engineering and Science, Indore, India</i>
15:20-15:40	Title: Green Jobs for Climate Resilience: Ghana's LIPW Experience Prosper Basommi Laari, <i>University of Business and Integrated Development Studies, Ghana</i>
15:40-16:00	Title: Environmental Commitment in Moroccan SMEs: Exploring Managerial Drivers Hanan FALI, <i>Ibn Zohr University, Morocco</i>

REFRESHMENT BREAK 16:00-16:20

16:20-16:35

Title: Leveraging Historical Collision Alert Data: Kinematic and Spatial Analysis for Location-Based Classification

Arthur Rocha França, *Hexagon Mining, Brazil*

16:35-16:50

Title: GIS-Based Assessment of the Potential for Photovoltaic Panels and Green Roofs in Iași, Romania

Otilia Pitulac, *Gheorghe Asachi Technical University of Iasi, România*

16:50-17:10

Title: Nitrogen Use Efficiency: A Nature Based Technique to Mitigate Nitrate Pollution under Changing Climate

Jothimani Subbiah, *Tamil Nadu Agricultural University, India*

17:10-17:30

Title: Beyond Formal Law: Harnessing African Indigenous Knowledge to Foster Green Marketing Governance and Sharing Economy

Chipo Mutongi, *Midlands State University, Zimbabwe*

17:30-17:50

Title: A Multicriteria Framework for Evaluating Walkability and Non-Motorized Transport Infrastructure for Climate-Smart Urban Mobility in Pune City

Arjun Singh Lodhi, *COEP Technological University, India*

17:50-18:10

Title: Climate Change and Indigenous Knowledge through Nature-Based Solutions: Adaptation, Mitigation, and Livelihood Resilience Challenges of Indigenous Communities in the Chittagong Hill Tracts of Bangladesh

Uyi Shing Marma, *Chittagong Hill Tracts Research Society (CHTRS), Bangladesh*

(Video
Presentation)

Title: Physicochemical and Photoluminescence Properties of Piperine Thin Films Prepared by Spin Coating

Faridah Abdul Razak, *Universiti Putra Malaysia Sarawak, Malaysia*

NETWORKING

END OF DAY 2

BOOKMARK YOUR DATES

6th GLOBAL SUMMIT ON

**ADVANCES IN EARTH SCIENCE
AND CLIMATE CHANGE**

September 2027 | Paris, France

DAY 01



5th GLOBAL SUMMIT ON

ADVANCES IN EARTH SCIENCE AND CLIMATE CHANGE

SEPTEMBER 24-25, 2026 | LONDON, UK

SPEAKER TALKS



Climate Change Displaced Persons' Governance in Latin America with a Focus on Brazil

Andrea Pacheco Pacífico¹ and Lara Cecília Araújo dos Santos²

¹Study and Research Centre on Environmentally Displaced Persons (NEPDA), Paraíba State University, Brazil

²Graduate Programme in International Relations
Paraíba State University, Brazil

Latin American countries treat refugees and internally displaced persons in different ways, particularly those who flee from environmental degradation or climate change. There are not regional standard rules, policies or initiatives to recognise and protect them. Brazil, for instance, has two different regimes. Firstly, the 1997 Brazilian Refugee Law that has enlarged the 1951 Refugee Convention definition to include displaced persons for grave and generalised human rights violation as refugees, what should include those fled from the consequences of climate change. Secondly, the 2017 Migration Law that may grant temporary resident visa for humanitarian reasons, including displaced for disasters. It means that Brazil recognises internationally environmentally displaced persons (EDPs), under the new 2017 Migration Law, with the option to apply for humanitarian visa, whilst environmentally/climate change IDPs remain invisible, without legal recognition or target policies. This hybrid regime has culminated at an unequal and unfair protection, at national and international levels, particularly for those displaced by disasters, for instance, drought, storms, land sliding, dams, and conflicts. Hence, based on Zetter's full protection conceptualisation (2014) – based on status, needs, and rights -, the research question is the following: To what extent do some Latin American countries' regimes for the recognition of EDPs, be they international or domestic, lead to an equal and fair protection, in comparison with Brazil? The author has applied Bett's regime stretching at the implementation level (2010), under a network society communicative model, to recognise them and give due protection (Pacífico, 2022). This interdisciplinary research was quanti-qualitative and explanatory, under literature review and fieldwork with interviews previously authorised by the Ethics Committee. The deductive, historic and comparative methods assisted the researcher to conclude that environmentally displaced persons – as those affected by climate change - in Latin America, particularly in Brazil, have been unprotected, invisible and left behind.

Presenter:

Andrea Maria Calazans Pacheco Pacífico

Study and Research Centre on Environmentally Displaced Persons (NEPDA)
Paraíba State University, Brazil



Bridging the Gap in Earthquake Prediction: Operational Forecasting via Multi-Sphere Data Integration

Angelo De Santis

Istituto Nazionale di Geofisica e Vulcanologia, Italy

Reliable short-term earthquake prediction requires tracking the complex preparation process across multiple Earth systems, within the framework of Geosystemics. This study presents an operational strategy that analyses lithospheric, atmospheric, and ionospheric datasets for pre-seismic disturbances. Our analytical methods evaluate anomalies against strict criteria to filter true precursors. Notably, retrospective testing reveals a 69% to 83% success rate for individual parameters, with even greater predictive power achieved when combining independent indicators. These findings highlight the critical role of integrated geophysical monitoring and mark a significant step toward a dependable, real-time early warning system.

Presenter:

Angelo De Santis

Istituto Nazionale di Geofisica e Vulcanologia, Italy



Regionalization Approaches for the Spatial Analysis of Extremal Dependence with Applications in Climate Research

Thorsten Dickhaus¹, Justus Contzen^{1,2} and Gerrit Lohmann^{1,2}

¹University of Bremen, Germany

²Alfred Wegener Institute Bremerhaven, Germany

The impact of an extreme climate event depends strongly on its geographical scale. Max-stable processes can be used for the statistical investigation of climate extremes and their spatial dependencies over a continuous area. Most existing parametric models of max-stable processes assume spatial stationarity and are therefore not suitable for the application to data that cover a large and heterogeneous area. For this reason, it has recently been proposed to employ a clustering algorithm to divide the area of investigation into smaller regions and to fit parametric max-stable processes to the data within those regions. We investigate this clustering algorithm further and point out that there are cases in which it results in regions on which spatial stationarity is not a reasonable assumption. We propose an alternative clustering algorithm and demonstrate in a simulation study that it can lead to improved results. We also apply the two algorithms to precipitation data from a global climate model. The presentation is based on: <https://doi.org/10.1007/s10687-025-00519-2>

Presenter:

Thorsten Dickhaus

University of Bremen, Germany



Developing Integrated Hydrologic Modeling and Flood Mitigation Strategies for the Takwi Creek Watershed, Philippines

Maria Cristina V. David

College of Engineering and Computer Studies
Pampanga State Agricultural University, Philippines

Effective flood mitigation strategies are essential for safeguarding communities and minimizing economic losses, particularly in watersheds vulnerable to flash flooding. This study presents an integrated approach to hydrologic modeling and flood mitigation planning for the Takwi Creek Watershed in Pampanga, Philippines—an area highly susceptible to flooding due to its physiographic characteristics and climatic conditions. Using the hydrologic Modeling System (HEC-HMS), a comprehensive model was developed from physical parameters, topographic data, and historical hydrometeorological records. The model was calibrated and verified against observed streamflow data from Typhoon Pepeng and Typhoon Santi events, ensuring reliability in simulating rainfall–runoff dynamics under various scenarios. Rainfall–runoff analyses revealed significant sensitivity to land-use changes, soil type, and rainfall intensity. Scenario testing of structural (e.g., channel widening, levees, retention basins) and non-structural (e.g., floodplain zoning, public awareness) measures demonstrated notable reductions in peak outflow—up to 6.1% in extreme events—and increased temporary storage capacity. Findings underscore the value of integrating advanced hydrologic modeling with community-informed strategies for sustainable flood risk management. The approach provides a decision-support framework applicable to other flood-prone watersheds in the Philippines and beyond.

Presenter:

Maria Cristina V. David

Pampanga State Agricultural University, Philippines



Weathering the Storms: Climate Vulnerability and Consequential Impacts upon the Poor in the US

Carol Camp Yeakey¹, Allison S. Reed² and Bronwyn Nichols Lodato³

¹The Marshall S. Snow Professor of Arts & Sciences, The School of Arts & Sciences; Professor of Public Health, The School of Public Health, Washington University in St. Louis, USA

²The School of Arts & Sciences, Department of Women & Gender Studies, Washington University in St. Louis, USA

³The School of Arts & Sciences, Department of Education; Department of African American Studies, Washington University in St. Louis, USA

This research has two purposes. First, it provides case study analyses examining the devastating results of climatic effects of recent tornadoes and hurricanes in the US over the past five years. It goes beyond describing the generic destruction of these weather events to focus upon the yet unresolved human toll and suffering of the most vulnerable, the poor. Two research questions emerge. First, after the storms, what have been governments' responses on federal, state and local levels to the most vulnerable citizens. Second, what are the multiple dimensions of housing insecurity that are exacerbated and remain unresolved, months and years after the storms? Pictures, interviews with affected residents provide a telling portrait of government ineptitude, failure, dismissal and political favoritism on multiple levels.

The second purpose of this presentation is to examine and review overall, the decreasing role of FEMA (Federal Emergency Management Agency) and EPA (Environmental Protection Agency) in addressing national climatic crises in the U.S. and current disaster responses, under the administration of President Donald Trump. Again, using case study analysis, historical documentation, public health data, and policy analysis of federal, state and local records, initial findings reveal: federal portrayal of climate science as a hoax; withholding of FEMA funds from 'blue' states, and 'blue cities' in 'red' states; slow pace of disaster relief in 'red' states; federal denial of government funding supports; racial disparity and animus in disaster response; major budget cuts, grants cancellations in both FEMA and EPA; the termination of federal grants to states and local governments; the public health consequences of climatic disasters; and, the federal shift of all disaster response relief and financial responsibilities away from the federal government onto states, cities and to individuals themselves. A discussion of the foregoing and their intended and unintended consequences, given growing climate vulnerabil-

ities, amidst the current political climate in the United States, concludes this presentation.

Presenter:

Carol Camp Yeakey

Washington University in St. Louis, USA



Addressing Climate Change Challenges through Decarbonizing of India's Automotive Sector: An Optimal Fuel-Drive Mix Scenario for 2035

Prasanna G. Tillu and **Abhijeet K. Digalwar**

Department of Mechanical Engineering
Birla Institute of Technology and Science, India

Introduction: Worldwide, the automotive sector is focussed on substituting current fossil fuels with cleaner alternatives for reducing harmful greenhouse gas (GHG) emissions, air pollution and combat climate change. India is hence adopting alternate low emission fuels like compressed natural gas (CNG), biofuels, pursuing new technologies like hybrid vehicles (HEVs), hydrogen-powered vehicles (HPVs) and aggressively promoting zero emission fully electric vehicles (FEVs). These solutions must encompass reliability, cost-effectiveness, circularity, longevity and optimality. This study addresses above challenges, aligns with India's upcoming nationally determined contribution (NDC 3.0) and decarbonization policy till 2035 and derives an optimal fuel and drive mix.

Methodology: The study adopts a machine learning (ML) based time series forecasting for vehicle inventory, constructs a scientific model, factors in relevant six cost and benefit factors and evaluates eleven different scenarios using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method for deriving the optimal mix and verifies its robustness through sensitivity analysis.

Results: The optimal mix for 2035, indicates substantial reduction in the share of fossil fuels (50%), with healthy increase in the adoption of electric vehicles (40%), biofuels (8.4%), CNG (0.6%), HEVs (0.5%) and HFVs (0.5%). This shift towards alternate fuels and technologies will reduce fossil fuel imports by around \$41 billion and GHG emissions by 54% compared to current levels, enabling mitigating the environmental challenges.

Conclusions: Unlike energy sector, India lags in focussed studies regarding optimal fuel / drive mix for automotive sustainability. This study addresses the gap, providing critical insights to government, industry, and academia for formulating automotive decarbonization policies. This study model is being enhanced into an AI based energy – environment – scenario based optimization tool integrating India's energy and automotive sectors to enable fine tune future policies towards achieving net zero targets by 2070.

Presenter:

Prasanna Gajanan Tillu

Birla Institute of Technology and Science, India



Waste-to-Hydrogen Conversion of Sugar Beet Pulp via Steam Gasification and MOF-Based CO₂ Separation

Nezihe Ayas, Damla Dumlu and Serkan Karadeniz

Department of Chemical Engineering, Faculty of Engineering
Eskisehir Technical University, Turkey

Agro-industrial residues represent an important resource for circular waste-to-energy systems, particularly when they are generated in large quantities at centralized processing facilities. In this study, sugar beet pulp was evaluated as a renewable lignocellulosic feedstock for hydrogen-rich gas production through steam-assisted thermochemical conversion. The work focuses on an integrated waste-to-hydrogen pathway combining steam gasification, catalytic reforming, and downstream CO₂ separation using metal-organic frameworks.

Air gasification was used as a comparative baseline and produced a combustible syngas containing approximately 20 mol% H₂; however, nitrogen dilution and limited reforming activity restricted the overall gas quality. Replacing air with steam significantly improved the hydrogen content, increasing H₂ concentration to above 60 mol% and demonstrating the potential of steam gasification for upgrading biomass-derived gas streams. Since hydrogen-oriented applications require further gas purification, MOF-based CO₂ separation was evaluated as a downstream upgrading stage. Owing to their high surface areas, tunable pore structures, and crystalline frameworks, MOFs offer a promising route for selective CO₂ removal from biomass-derived syngas.

Overall, the study presents sugar beet pulp valorization as an environmentally relevant waste-to-hydrogen pathway within circular waste-to-energy systems. By integrating steam gasification with MOF-based CO₂ separation, the proposed approach contributes to agricultural residue management, renewable hydrogen-rich fuel production, CO₂ mitigation, and the development of low-carbon energy conversion strategies. This integrated route therefore supports the broader transition toward sustainable energy systems through the combined utilization of biomass residues and advanced gas upgrading technologies.

Presenter:

Nezihe Ayas

Eskisehir Technical University, Turkey



Integrating Climate and Sustainability Competencies into Textile Education through Micro-Credentials

Ada Traumann¹, Marjaana Tanttu², Marjaana Mäkelä³, Simona Vasile⁴ and Ann-Charlotte Höjjer⁵

¹TTK University of Applied Sciences, Estonia

²Metropolia University of Applied Sciences, Finland

³School of Vocational Teacher Education, Haaga-Helia University of Applied Sciences, Finland

⁴HOGENT University of Applied Science and Arts, Fashion and Textiles Innovation Lab (FTILab+), Belgium

⁵Department of Textile Technology, University of Borås, Sweden

The textile and clothing sector (TCS) is undergoing significant transformation driven by sustainability goals, circular economy principles, and rapid technological change. These developments require flexible lifelong learning opportunities that enable learners and professionals to acquire targeted competencies. The aim of this study was to develop and pilot sustainability-oriented micro-credentials tailored to the needs of the TCS.

The research was conducted within the Erasmus+ project SusTexEdu (2022–2024), which focuses on strengthening sustainability education in the sector. A mixed-method approach was applied to identify relevant green skills and competency gaps. Data were collected through an online survey and structured interviews with representatives from the textile industry and educational institutions in Belgium, Estonia, Finland, Hungary, and Sweden.

Based on the results, six micro-credential modules comprising 25 learning units were designed to support learners at EQF levels 4 and 6, as well as industry professionals seeking upskilling opportunities. The modules address key sustainability themes such as textile materials, processing technologies, and circular economy principles. To ensure quality and transparency, a standardized syllabus template and a quality assurance handbook were co-developed. Thirteen learning units were piloted in partner institutions, and feedback was gathered from students, teachers, and industry experts.

The results demonstrate that micro-credentials can provide flexible and targeted learning pathways that respond to evolving competence needs in the textile sector. The developed framework supports the integration of sustainability topics into vocational and higher education and offers practical guid-

ance for institutions implementing similar initiatives. The study concludes that micro-credentials represent an effective tool for strengthening lifelong learning and supporting the transition toward a more sustainable textile and clothing industry.

Presenter:

Ada Traumann

TTK University of Applied Sciences, Estonia



Protected Areas and Community Based Conservation: Some Management Perspectives from the Southern Western Ghats in India

Sugato Dutt

Tamil Nadu Compensatory Afforestation Management Plan Authority, India

The conventional “Fortress” Model of conservation using “fences and fines” approach to deter local conflict with the goals of Park Management is often critiqued for its failure to generate livelihood alternatives and the lack of compliance with conservation regulations in the local community. Over time these classic “set aside” models of Park Management begun to be challenged, and newer models emerged which combined conservation efforts with local economic development. In the developing economies of the tropics such “community centered conservation” projects arose within the landscape “matrix” where these Parks were situated.

This study examines the conservation related goals and objectives of such specialized conservation-cum-development projects and traces the outcomes of various state sponsored schemes therein. It focuses on initiatives in the southern hill ranges of the Western Ghats mountain chain, a global biodiversity hotspot threatened from human activities such as agricultural expansion, urbanization, infrastructure development with resultant ecosystem fragmentation and compromised ecosystem services therein. These projects are therefore an exercise in Land Use Planning and Management.

The research further examines the status of forests in the more topographically diverse Southern Western Ghats ecoregion. It assesses the impact of community-based government programs that support conservation gains both in the core zone of Protected Areas and the surrounding multi-use buffer zones in this globally recognized biodiversity hotspot.

Drawing from a Multiple Mini Case Studies methodological approach, the study lists projects in the ecoregion implementing a uniquely Indian model of community based conservation, named *ecodevelopment*, which combines rural development with the restoration of degraded wildlife habitat. Ecodevelopment projects identify, establish and implement alternatives to the unsustainable harvest of local biomass resources (fodder and fuelwood); increase the involvement of the local community in conservation planning; and establish institutional collaborations with local self-government towards

programme implementation. Causes of ecosystem degradation, alternative livelihoods and project outcomes are identified in these mini case studies and an analytical framework is developed so as to understand the contributory factors for successful project outcomes.

The study reveals that the local community has developed a general capacity to reduce its dependence on biomass resources for livelihood. Moreover, the collaborative institutions have developed financial self-sufficiency for accessing biomass resources outside of the ecologically sensitive protected areas thereby attaining the conservation objectives of the aforementioned projects.

Presenter:

Sugato Dutt

Tamil Nadu Compensatory Afforestation Management Plan Authority, India



Unraveling Climate Change Vulnerabilities of Wetland Communities: Insights from *Hakaluki Haor* in Bangladesh

Md Amdadul Haque¹, Zayeda Sharmin² and Mohammad Jahirul Hoque²

¹Associate Professor, Department of Political Studies
Shahjalal University of Science and Technology, Bangladesh

²Professor, Department of Political Studies
Shahjalal University of Science and Technology, Bangladesh

Wetland communities in Bangladesh face significant threats from climate change. Climate change threatens the lives and livelihoods of the majority of people in *Hakaluki Haor*. This study aims to investigate the climate change vulnerabilities and adaptive strategies for resilience in the *Haor* area in Bangladesh. Qualitative data were collected through in-depth interviews with 30 respondents from five distinct areas of *Hakaluki Haor* in Bangladesh. Data were analyzed thematically to assess the climate change vulnerabilities of the wetland communities. The results show that respondents from different regions with diverse climate risks shared similar and unique perspectives on climate change, including its causes, effects, and solutions. The findings suggest that the agriculture- and fishing-dependent communities in this region are highly vulnerable to the socio-economic impacts of climate change. However, due to the changing climate, the frequency and intensity of natural disasters have increased in *Hakaluki Haor*. Consequently, this area experiences significant loss of crops and livestock. This results in a decline in income and an increase in poverty levels in the *Hakaluki Haor* region. Moreover, the changing weather patterns led to unusual floods and droughts, making it difficult for farmers to irrigate their crops. Extreme weather patterns exacerbate the situation, leading to a decline in agricultural productivity and posing a severe threat to the livelihoods of people in the *Haor* areas of Bangladesh. Farmers in the *Haor* region are forced to rely on debt in this situation. A greater reliance on debt increases the credit risk for those who are already vulnerable. Their lives and livelihoods are thus directly impacted by climate change and EWEs, and they also face the double whammy of being ensnared in debt during a crisis. This study suggests that implementing adaptation measures, such as crop diversification, building resilient infrastructure, and promoting sustainable livelihoods, can mitigate these climate hazards.

Presenter:

Md Amdadul Haque

Shahjalal University of Science and Technology, Bangladesh



Climate Change and Natural Disasters: Examining the Psychosocial Issues that Impact Female-Headed Households Post-Hurricane Maria in Dominica

Debra D. Joseph

Department of Government, Sociology, Social Work and Psychology, The University of the West Indies, Cave Hill Barbados

Hurricane Maria made landfall on the southwest coast of Dominica on the 18th September 2017 as a category 5 Hurricane with 160mph wind speed. This left 31 people dead, 37 missing. Around 65,000, that is, approximately 80% of the population were directly affected and more than 90% of roofs were damaged or destroyed. Power and water supplies were disrupted and entire crops destroyed.

There was an estimate of 930.9 million damages. Most being sustained in the housing sector (38%), followed by transport (20%) and education (8%). Four months after the hurricane, Dominica was severely affected. Around 450 people resided in collective shelters. Over 80% of houses still have inadequate roofing.

This research examined the psychosocial issues that faced the Dominican population of female headed households after Hurricane Maria. It also examined the current physical state of homes of these women as they struggle to find some form of normalcy in living. Its main focus will support community resilience, one of the four priority areas of the Regional Comprehensive Disaster Management Strategy. The results can hopefully motivate people and or organisations to become more involved in comprehensive disaster management and have long term changes which can have a positive national, regional and international implications for strengthening disaster resilience.

Pre-existing, structural gender inequalities mean that disasters affect women and girls in different ways than they affect boys and men. The vulnerability of females increases when they are in a lower socioeconomic group, particularly in the Global South. This vulnerability impacts preparedness, evacuation, response, number of deaths and recovery. The reasons for this vulnerability can often be traced to the roles females hold in society and existing gender and cultural norms where they live. Research in this area can help the understanding of women and how they cope in such disasters.

The aims were: To examine the living conditions of persons immediately after Hurricane Maria and also four years later; to find out what issues and challenges are impacting their quality of life and to expose the gaps in their current needs.

The aims of this small case study sought to:

- Gain knowledge from a woman's perspective on disaster impact.
- Examine coping after the disaster (psychological, social, economical)
- Expose gaps in assistance (needs) post disaster and 4 years later.

Method:

- A qualitative approach utilising a case study method with a semi-structured protocol was done. Photo-voice was incorporated as it brings photographic documentation of the disaster to the fore and poignantly enhances the recollection of such a disaster.

Findings- Post Maria:

- Significant amount of loss and damages. Two individuals reported losing their home as Maria demolished the entire structure
- Water damaged flooring, walls, doors, furniture, cupboards, appliances, and electronics, as well as compromised electrical systems.
- Participants also reported losing windows, water tanks, and in the case of those who were self-employed, losing their source of income because Hurricane Maria destroyed their place of work.
- Most of the participants found themselves needing a place to stay and reported their struggles with finding one that was safe and secure.

Findings Four Years Later:

- Hurricane Maria compromised the country's phone, internet, and television services, persons residing in various communities across the nation are still encountering difficulties accessing these services
- Consistent with one of the respondents, many of them now have to rely on expensive and limited data plans to gain internet access, which thereby forces them to limit their social interactions due to lack of funds

Presenter:

Debra D. Joseph

The University of the West Indies, Cave Hill, Barbados



Biogeotechnics: Study of Root-Reinforcement in Strengthening the Soil

D. Ashwini and **C. Ramakrishnegowda**

Maharaja Institute of Technology Mysore

Visvesvaraya Technological University, Belgaum, Karnataka, India

This paper focuses on characterizing the root and employing vetiver root reinforcement to fortify soil. The gramineous perennial grass known as vetiver grass is indigenous to tropical and subtropical regions of India, China, the Philippines, and Indonesia. The most noticeable feature of the species is the growth of 2m-3m deep roots with a highly branching rootstock. The study investigates how vetiver roots affect soil shear parameters c & ϕ . The effect of vetiver roots on soil characteristics is investigated in the study using laboratory shear box test trials. The paper also compares vetiver roots in different soil and also with other roots using machine learning to comprehend the mechanical and physical characteristics of the root. The study's findings highlight the value of integrating AIML methods in the assessment of plant roots and point to the possibility of Vetiver root- reinforcement as a successful and long-lasting bio-geotechnical solution for soil stabilization. The results offer valuable information for researchers and engineers interested in using bio-geotechnical methods for sustainable soil strengthening.

Presenter:

D. Ashwini

Maharaja Institute of Technology Mysore

Visvesvaraya Technological University Belgaum, Karnataka, India



Assessment of Circularity and Minimization of CO₂ Emissions in the Overall Industrial Construction System – The Path to a Sustainable Transformation along the Value Chain: Case Study of a Building Assessment with Madaster

Juergen Reichardt^{1,2}, Jonas Kerstgens¹, Maximilian Joe Kaufmann², Leonard Rieke³, Matthias Schmidt³ and Christian Blanke⁴

¹MSA | Münster School of Architecture

University of Applied Sciences, Germany

²RMA | Reichardt-Maas-Assoziierte Architekten GmbH & Co. KG
Germany

³IFA | Institute of Production Systems and Logistics
Leibniz University Hannover, Germany

⁴Madaster Germany GmbH, Germany

The industrial sector is responsible for a large part of the environmental impact. Integrating the circular economy into the planning and operation of industrial buildings can help to reduce resource consumption and environmental impact. This development affects various systems such as the location, the building structure, the building services, the production processes and the logistics. Considering sustainability in each of these areas can help reduce CO₂ emissions and reduce environmental impact. In this context, a case study at the Münster School of Architecture (MSA) investigated important aspects of circularity in climate-friendly industrial construction. The preliminary design of a factory building (RMA), evaluation models of circularity and CO₂ efficiency (madaster) as well as factors from production and logistics (IFA, Institute for Factory Systems, Leibniz University Hannover) formed the basis of this study. In this publication, the five active systems mentioned are first roughly outlined. In addition, the aspect of the building structure is considered in more detail in various construction variants. This creates the basis for the overarching goal of evaluating the overall industrial construction system in the context of circularity, taking into account the dependencies between the individual disciplines and subsystems.

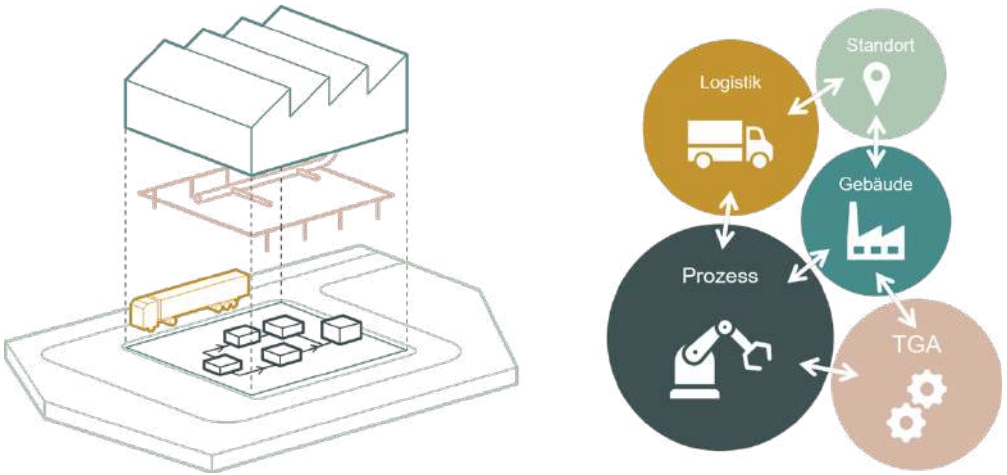


Illustration 1: Holistic and synergetic circularity planning and evaluation

Presenter:

Juergen Reichardt

MSA | Münster School of Architecture, University of Applied Sciences, Germany



Improving TiO₂ Photocatalytic Performance in Water Hydrolysis: A DFT Study

E. Esra KASAPBASI

Beykoz University, Turkey

Titanium dioxide (TiO₂) is a widely used photocatalyst for removing hazardous pollutants from water and air due to its low cost, chemical stability, and strong oxidative potential. Upon irradiation, it generates electron-hole pairs that form reactive oxygen species, particularly hydroxyl radicals, driving pollutant degradation. However, its wide band gap (~3.2 eV) limits activation to the UV region and, together with rapid electron-hole recombination, reduces overall photocatalytic efficiency. Despite extensive research, the role of different cations in influencing the photocatalytic activity of TiO₂ under solar irradiation remains insufficiently understood. Therefore, the aim of this study is to enhance the photocatalytic performance of TiO₂ *via* metal doping and, consequently, to improve its ability to promote water hydrolysis. For this aim, the non-defective anatase (001) surface was modeled using finite, neutral, stoichiometric cluster models derived from bulk anatase. Doped structures were generated by substituting a single Ti atom with selected metal cations, followed by geometry optimization to obtain minimum-energy configurations. The photocatalytic properties of TiO₂ clusters doped with metal cations of +3, +4, and +5 oxidation states were investigated using density functional theory (DFT), employing the B3LYP hybrid functional and the 6-31G(d) basis set. Subsequently, the water hydrolysis reaction was examined on the optimized cluster models.

The results indicate that all dopants reduce the band gap of TiO₂, thereby enhancing its activity under visible light. Moreover, metal doping was found to significantly influence water decomposition behavior. In clusters doped with +4 and +5 valence cations, water preferentially remained in a dissociated state, suggesting improved catalytic performance. Among the studied systems, the Ta⁵⁺-doped cluster exhibited the highest reaction energy. These findings highlight the importance of further investigations into the reaction energetics of +5 valence doped systems to better understand their contribution to photocatalytic activity.

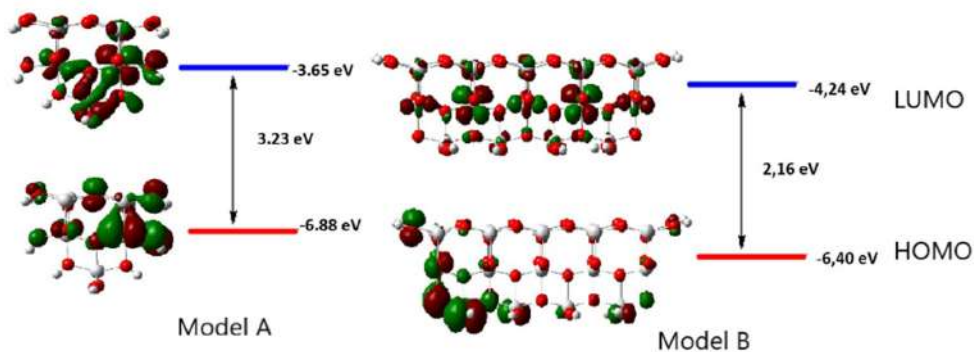


Figure: Frontier molecular orbitals and energies of undoped TiO₂ models

Presenter:

Emine Esra KASAPBASI

Beykoz University, Turkey



Salt Tolerant Halophyte Plants under Global Climate Change. Why their Roots Grow Faster under Rising Salinity?

Vadim Volkov¹ and Yizhou Wang²

¹K.A. Timiriazev Institute of Plant Physiology
Russian Academy of Sciences, Russian Federation

²Institute of Crop Science, College of Agriculture and
Biotechnology, Zhejiang University, China

Objectives: Climate change within the 20th century led to the global mean surface temperature increase which caused melting of polar ice caps and rise of water level in oceans, by about 20 cm. Ongoing climate change results in the further rise of sea level, flooding of large territories, salinization of agricultural lands, shortage of freshwater and desertification. Salinization of agricultural lands and subsequent migrations of populations may result in food insecurity and social disasters. At present, salinization costs annually over 27 billion USD to world agriculture only.

Methodology: The analysis of salinity tolerance of main agricultural plants under increasing land salinization questions whether and how the problem of food security under global climate change could be solved. Global production of wheat makes about 100 kg/(person per a year) (<https://www.statista.com/topics/1668/wheat/>), rice yields to 65 kg/(person per a year) (<https://worldpopulationreview.com/country-rankings/rice-production-by-country>). Wheat and more vulnerable rice essentially reduce productivity at moderate soil salinities over 50-100 mM NaCl and die at higher salinities. However, the known salt tolerant halophyte plants are able to grow at salinities up to seawater and above while their growth is often stimulated by moderate salinity of 200-300 mM NaCl. What are the mechanisms of the growth stimulation?

Results: The present research analyses how roots of different plants respond to salinity. The stimulation of growth of halophyte roots is observed at moderate salinities: it occurs against the rising osmotic pressure of external solution (over 1 MPa), oxidative stress and toxic effects of sodium ions. The cell membrane ion transport mechanisms behind the phenomenon are discussed together with the opportunities to transfer the trait to salt sensitive agriculturally important crops.

Conclusions: The only undisputable solution of global warming and its consequences is the abrupt decrease in emissions of greenhouse gases. How-

ever, the developing agriculture may provide certain buffering capacity to ensure global food security.

Presenter:

Vadim Volkov

K.A. Timiriazev Institute of Plant Physiology, Russian Academy of Sciences
Russian Federation



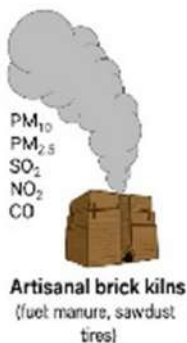
Evaluating Concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂, CO, O₃, and H₂S Emitted by Artisanal Brick Kilns in Juliaca, Peru, Using a Low-Cost Sensor Network and AERMOD Model

José Luis Pineda-Tapia, Edwin Huayhua-Huamaní, Milton Edward Humpiri-Flores, Deyna Lozano-Ccopa, Robinson Chaiña-Sucasaca and Milagros Lupe Salas-Huahuachampi

Universidad Nacional de Juliaca, Peru

This study aimed to rigorously quantify and analyze the concentrations of atmospheric pollutants (PM₁₀ and PM_{2.5}), precursors (SO₂, NO₂, CO, and H₂S), and secondary (O₃) emitted by artisanal brick kilns in Juliaca City, Peru. The AERMOD dispersion model and a network of low-cost sensors (LCSs), composed of 5 real-time air quality measurement modules, Qawax, were employed to characterise air quality at specific receptor sites. A GPS and UAV georeferenced inventory of kiln operations was created to determine their parameters and operational intensity, providing a foundation for estimating emission factors and rates. Data were obtained from the United States Environmental Protection Agency (EPA) and supplemented with locally gathered meteorological records, which were processed for integration into the AERMOD model. The findings revealed that brick kilns are a principal source of atmospheric pollution in the region, with carbon monoxide (CO) emissions being especially pronounced. The LCSs facilitated the identification of pollutant concentrations at various locations and enabled the quantification of the specific contribution of brick production to ambient aerosol levels. Comparative assessments determined that these sources account for approximately 85% of CO emissions within the study area, underscoring a significant adverse impact on air quality and public health. The model was also properly configured based on the most reliable meteorological and geophysical information available, in addition to justifying the technical assumptions for optimal modelling. Background pollutant levels, emission rates, spatial distributions, and concentration patterns were analysed within the assessment zones, resulting in solid model performance. These results provide a sound scientific basis for the formulation and implementation of targeted environmental mitigation policies in urban areas and the outskirts of Juliaca.

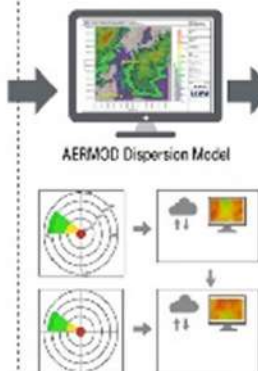
1. Problem Source



2. Data Collection



3. Modeling & Simulation



4. Key Results

CO and PM₁₀
exceeded
air quality standards

CO 33,216

PM₁₀ 562 µg/m³

SO₂ 272 µg/m³

PM_{2.5} 110 µg/m³

Presenter:

Jose Luis Pineda Tapia

Universidad Nacional de Juliaca, Peru



Rare Earth Elements: A Review of Primary Sources, Applications, Business Investment, and Characterization Techniques

LÍlian Lefol Nani Guarieiro^{1,2}, Caio Silva A. Felix^{2,3}, Clara Rodrigues Pereira¹, Melise Lemos Nascimento¹, Madson Moreira Nascimento^{1,2}, Jefferson Bettini⁴, Jeancarlo Pereira dos Anjos⁵, Alexandre Pereira Wentz¹, Pollyana da Silva Melo¹, Paulo Henrique Marques Modesto¹, Fabiano Ferreira de Medeiros¹, Beatriz Almeida Santos Castro¹, Fabricio Dias Rodrigues¹, Sara Silva Alves¹ and Maria das Graças Andrade Korn²

¹University SENAI CIMATEC, Brazil

²Instituto Nacional de Ciência e Tecnologia em Energia e Ambiente – INCT, Brazil

³Universidade Federal da Bahia (UFBA), Brazil

⁴Centro Nacional de Pesquisa em Energia e Materiais - CNPEM Brazil

⁵Universidade Federal de São Carlos, Brazil

Minerals bearing rare earth elements (REEs) are formed through long and complex geological processes, with monazite, bastnäsite, xenotime, and ionic adsorption clays representing the most economically exploited sources. Although Brazil hosts one of the largest REE reserves worldwide, its current production remains limited, while China dominates the global market, controlling more than half of the world's supply. Due to their strategic role in advanced clean and low-carbon energy technologies, REEs have become essential to the global energy transition. Their applications include catalyst synthesis, ceramic and metallurgical industries, as well as high-demand technologies such as computer memory devices, rechargeable batteries, and mobile phones. As demand for these critical minerals increases, mining companies are under growing pressure to adopt cleaner production practices and reduce environmental impacts associated with exploration and extraction. In this context, the development and application of robust analytical techniques have enabled the characterization of REEs within complex, multi- element geological matrices, supporting the identification of new mineral reserves. These advances contribute to more efficient, sustainable, and environmentally responsible exploration strategies, aligning mineral resource development with global sustainability and decarbonization goals.

Presenter:

Lílian Lefol Nani Guarieiro

University SENAI CIMATEC, Instituto Nacional de Ciência e Tecnologia em
Energia e Ambiente – INCT, Brazil



Novel Concept and Technologies of Sustainable Building Design

Juergen Reichardt¹, Indranil Bhattacharya² and Upendra Rajapaksha³

¹MSA | Muenster School of Architecture, University of Applied Sciences, Germany

²RV College of Architecture, India

³Department of Architecture, Moratuwa University, Sri Lanka

“What are the current digital and /or innovations driving sustainable architecture? What could be the suggestions for a more holistic approach?”

Sustainable design parameters may be visualized as the ‘genetic code’ of a building’s specific performance requirement – similar to the DNA of all living entities. This “*Building DNA*” could provide comprehensive “Performance” parameters; further could be programmed to be SMART – Sensible, Meaningful, Adaptive, Realistic and Time-cost effective. Back in 2001, a highly networked, expertise-orientated, integrated design strategy of “Form Follows Performance” was coined for our workspaces and research in India, Sri Lanka and Germany largely for industrial projects and passive housing. In planning process, “Virtual Twins” apply the state of the art of 3D- BIM modelling for architecture, structure and utilities integrated with dynamic climatic simulations and CFD analysis, sustainable parameters and ‘cradle to grave’ life-cycle systems. Furthermore, Programming has become an all-important task, as specific parameters of geography, climate, topography, culture, process, technology, and logistics are key forces driving innovative and integrated architecture from a preliminary stage. While we are shaping out “Passive” sustainable design solutions for site, volume, structure, envelope, interiors, we are minimizing the need for “Active” utilities. It is vital that the ecological responsibility lies in ‘*designing sailboats and not motorboats in architecture*’.

The German government BMBF, Federal Ministry of Education and Research, and DAAD, German Academic Exchange Service, funded program culminated in a web-portal and app “*climatehub.online*” (fig.1) holistic design strategies and academic research created a broader audience, a collaborative and deeper understanding of the topics on hand and a one-of-a-kind E- Learning Platform - Program. We believe that Individual approaches of experts should be linked together for a ‘synergetic’ approach. It is believed that this

combined effort across OUR PLANET could be more productive than addressing the issues individually / locally.

Presenter:

Juergen Reichardt

MSA | Muenster School of Architecture, University of Applied Sciences, Germany



An Investigation of the Dynamic Behaviour of Offshore Wind Turbine Support Structures in Harsh Norwegian Marine Environments

Giancarlo (Ioannis) Angelopoulos¹ and **Cliff Dansoh²**

¹Department of Engineering, City St. George's University, UK

²School of Architecture and Technology, University of Brighton, UK

To evaluate the hydrodynamic stability and dynamic response of a floating offshore wind turbine (FOWT) structure under extreme wave conditions using numerical simulation and mooring system analysis.

The FOWT considered is a spar buoy design specifically for use in deep water environments which are tethered to the sea bed with a tri-catenary system. The subsea power cable is a dynamic free hanging catenary, suspended from the keel of the spar buoy and connected to the sea bed export cable. Deep water consists of depths greater than 300 m. The chosen environment was the Norwegian continental shelf as this experience harsh weather environments and has recorded the highest rogue wave at 25.6m otherwise known as the “Draupner wave”. This wave was used as the source for the JONSWAP spectrum which empirically models the oceanographic wave energy distribution based on wave frequency.

The chosen spar buoy FOWT was modelled and its stability and dynamic performance was simulated in the diffraction/radiation and time domain. ANSYS AQWA incorporates the JONSWAP empirical models and was implemented by specifying the “all-out” storm for circa 400 seconds with a significant wave height, H_s of 20 m, encompassing a maximum wave height of circa 30m. The platform's dynamic response to harsh environmental rogue waves was simulated using the JONSWAP spectrum to determine the effect of hull mass distributions and mooring line configurations on catenary line tensional forces.

Deep-ballasted, slender spar design yields high hydrostatic stability (metacentric height ≈ 16 m) and low 3-axis rotational response. Three-line catenary mooring limits lateral motion and maintains peak tensions, ≈ 0.12 MN, $\ll$ Safe-Working-Load, 5–13 MN. The FOWT tended towards unforced stability between mean horizontal surges, $\leq \approx 120$ m and peak lateral drift ≤ 225 m. Heave oscillations were ≈ 20 m, and $3^\circ \leq$ pitch/roll $< 6^\circ$ max.

These findings demonstrate the inherent robustness of spar-buoy FOWTs in harsh seas, but highlight further work for large lateral drifts and tether dynamics.

Presenter:

Giancarlo Angelopoulos

City St. George's University, UK



Upcycling Post Consumer Textile Waste by Enabling Local Marginalized Community Development through Cloud-fulfilment Ecosystem

Richa Sharma¹, Venkataraman S² and Asim Patel³

¹Department of Textile, National Institute of Fashion Technology, Bengaluru, India

²Indian Institute of Management-Kozhikode, Strategic Management, India

³Rangori® - A Brand based in Bengaluru, India

Textile waste poses a mounting environmental crisis, with the sector accounting for 10% of global greenhouse gas emissions and rapid resource depletion *via* linear fast-fashion models. This paper examines upcycling post-consumer textile waste (PCTW)—discarded clothing, home textiles, and accessories—as a circular economy strategy. By transforming PCTW into higher-value products, upcycling mitigates landfill burdens while fostering jobs and micro-enterprises among urban marginalized communities, particularly women.

Rangori is a full stack climate adaptation company that partners corporates to adapt resilient workplaces by crafting plastic waste into intelligently synchronised biological heat sinks through the Cloud-fulfilment Ecosystem that functions as a mini circular ecosystem. The Cloud-fulfilment Ecosystem democratizes dignified, convenient and unitised upcycling work-from-home jobwork for urban marginalised women beneficiaries or ‘saheli’. It organises beneficiaries in women’s self-help groups (SHGs) and engages them *via* walk-in neighbourhood, Craft ATMs and simple and quick transactions. By its leaner, energy efficient, carbon-negative and women-friendly design, the fulfilment ecosystem reimagines solutions and co-creates shared value for multiple stakeholders—urban homemakers, urban slum women, waste producing consumers and companies, waste pickers, sellers and recyclers community, social/philanthropic organisations, carbon credit buyers, climate funds/investors and CSR corporates.

This research analyses fulfilment ecosystem implementation in Bangalore, India using mixed methods—interviews with SHG beneficiaries, impacts on waste diversion, women’s income generation and scalability barriers. Findings reveal the ecosystem’s potential to address hard problems of unsustainable urban homes, global boiling, unemployed women and post-consumer waste.

Presenter:

Richa Sharma

National Institute of Fashion Technology Bengaluru, India



Generation of Monthly Streamflows in the Ica River Basin up to the La Achirana Hydrometric Station Using the GR4J Rainfall–Runoff Model

Angel Gabriel Ochante Sanchez, Diego Fermin Jonislla Rojas and Abel Carmona Arteaga

Universidad Privada del Norte, Peru

Recurrent hydrological extremes, including river overflows and flood-related disasters, have highlighted the vulnerability of Pacific-slope basins in Peru, particularly the Ica River basin. In this context, this study aims to generate long-term monthly streamflow series for the Ica River basin up to the La Achirana hydrometric station using the conceptual GR4J rainfall–runoff model. The model is driven by gridded precipitation data from RAIN4PE and temperature-based evapotranspiration derived from ERA5, both obtained through the Google Earth Engine (GEE) platform. Model calibration and validation are performed using observed streamflow records from the National Water Authority of Peru (ANA), aggregated to a monthly scale. The performance of the GR4J model is evaluated using standard efficiency criteria, including the coefficient of determination (R^2) and the Nash–Sutcliffe efficiency (NSE), which indicate a satisfactory to very good agreement between observed and simulated flows. Compared to simpler monthly models, the GR4J structure allows for an improved representation of soil moisture dynamics, groundwater exchanges, and flow routing processes. The resulting extended streamflow series provides a consistent hydrological basis for analyzing long-term variability and supporting water resources planning in a data-scarce basin. This methodology demonstrates the potential of combining parsimonious hydrological models with high-resolution reanalysis and satellite-based datasets to improve flow estimation and contribute to flood risk management and climate-related impact assessments in arid and semi-arid regions.

Presenter:

Angel Gabriel Ochante Sanchez

Universidad Privada del Norte, Peru



Spatio-Temporal Analysis of Land Use/Land Cover Changes: Implications of Climate Variability in Gicumbi District, Rwanda (1995–2025)

Angela Oyilieze Akanwa^{1,2}

¹Faculty of Agriculture, Environmental Management and Renewable Energy (FAEMRE), University of Technology and Arts of Byumb (UTAB), Rwanda

²Chukwuemeka Odumegwu Ojukwu University (COOU), Nigeria

Sub-Saharan Africa is one of the most vulnerable regions to climate variability and change due to its heavy reliance on rain-fed agriculture, limited adaptive capacity, and rapidly transforming land systems. In East Africa, climate variability has intensified, marked by shifting rainfall patterns, rising minimum temperatures, and increasing frequency of floods and droughts (Nicholson, 2017; IPCC, 2021). These climatic pressures coincide with population growth, agricultural expansion, deforestation, and urbanization, placing growing stress on land resources and accelerating environmental degradation. In highland areas such as northern Rwanda, steep slopes and fragile soils further heighten vulnerability to erosion and hydrological instability, making land–climate interactions particularly complex.

Land use and land cover (LULC) change has emerged as a key driver of environmental degradation and climate vulnerability. However, many existing studies are constrained by short temporal scales, limited integration of climate variables, or insufficient focus on localized dynamics. In Rwanda, LULC research has largely emphasized national or watershed-level analyses, leaving a gap in long-term, district-scale assessments that are crucial for local planning and climate adaptation.

Guided by Human–Environment Interaction Theory, this study examines 30 years of spatio-temporal LULC dynamics in Gicumbi District, Northern Province, Rwanda (1995–2025), using a mixed-methods approach. Multi-temporal Landsat imagery (Landsat 7 ETM+ and Landsat 8 OLI) was processed using spectral indices (NDVI, NDWI, NDBI) and classified with a Random Forest algorithm, complemented by field observations, photographic evidence, and key informant interviews. Results reveal significant transformations: tree cover declined sharply from 53.77% to 3.81%, while built-up areas expanded from 0.12% to 8.88%, and cropland increased from 13.53% to 38.89%. These shifts have profound environmental and socio-economic implications, including reduced carbon sequestration, ecosystem service loss, soil erosion, altered hydrological regimes, and heightened climate vulnerability. The findings underscore the need for integrated land-use planning and climate-adaptive

strategies, such as agroforestry, reforestation, and sustainable agriculture, to support resilience and sustainable development in Rwanda's highland districts.

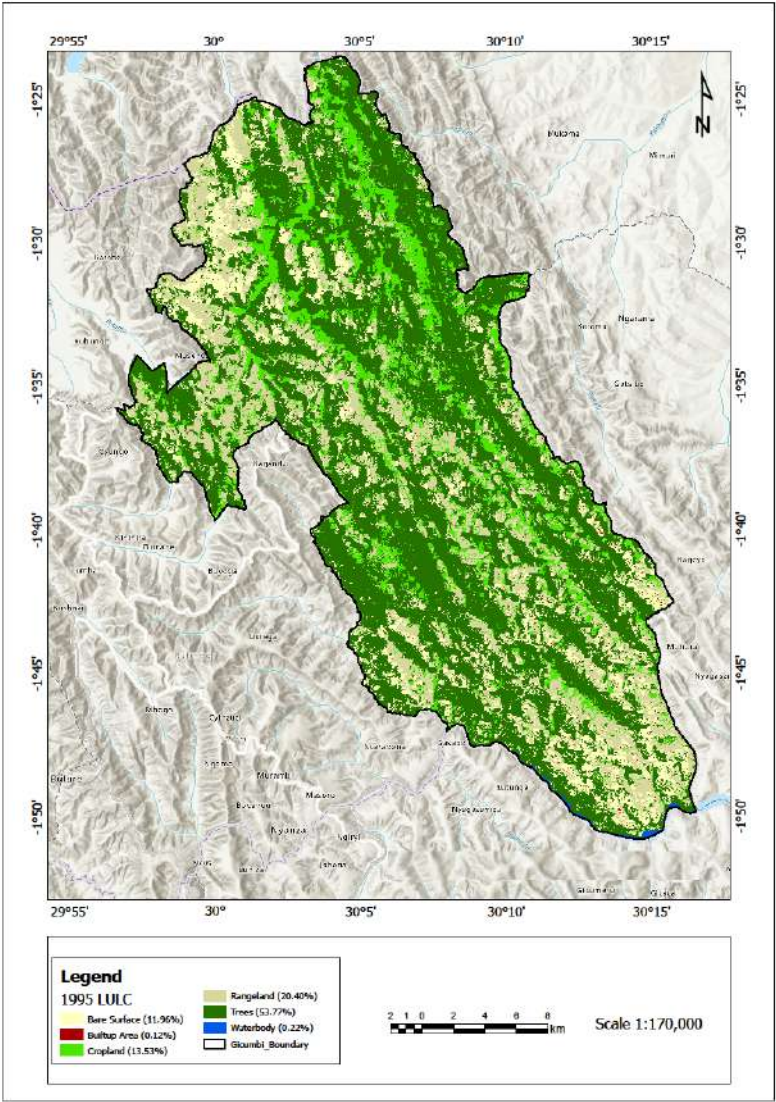


Figure 1: Land use and land cover (LULC) change of Gicumbi District, Northen Province Rwanda.
Source: Compiled by Author, 2026

Presenter:

Angela Oyilieze Akanwa

University of Technology and Arts of Byumba (UTAB), Rwanda

Chukwuemeka Odumegwu Ojukwu University (COOU), Nigeria



Energy-Efficient Autonomous Harvesting for Sustainable Vertical Farms Using Mobile Manipulators

Priyanka Verma and **Ekta Singla**

Indian Institute of Technology Ropar, India

Vertical farming has emerged as a sustainable agricultural solution capable of addressing food security challenges while reducing land and water consumption. Figure 1 presents the concept of a vertical farming system, which enables the cultivation of crops in multiple vertically stacked layers within a controlled environment. However, large-scale vertical farming environments require energy-efficient automation systems to enhance harvesting productivity and operational sustainability. Existing studies primarily focus on crop cultivation, environmental control, and robotic navigation, while limited attention has been given to energy-aware harvesting logistics involving autonomous mobile manipulators operating within multi-level farming environments. This study proposes an energy-aware autonomous harvesting logistics framework for sustainable vertical farming using a mobile manipulator system composed of an autonomous mobile robot (AMR), a vertical lifting mechanism, and a 6-DOF Kinova robotic manipulator as shown in Figure 2, so this framework specifically focuses on the robotic assistance in harvesting operations designed for multi-level lettuce harvesting operations in a structured indoor farming environment containing multiple rows and vertically stacked cultivation trays, as harvesting activities involve continuous robot navigation, lifting, manipulation, payload transportation, and unloading cycles, resulting in significantly higher operational energy consumption compared to tasks such as pruning and crop health monitoring. An event-based operational model is developed to analyze robot behavior during navigation, lifting, harvesting, unloading, and charging operations.

Interruption-aware harvesting strategies based on payload capacity and battery state-of-charge constraints. Operational interruptions caused by onboard storage saturation and battery discharge are modeled to evaluate harvesting continuity, return-to-supply events, charging cycles, and overall energy consumption patterns. Preliminary analysis indicates that robot routing strategies, payload capacity, and harvesting sequences significantly influence operational energy consumption and harvesting efficiency. The proposed framework aims to support the development of sustainable robotic harvesting strategies by minimizing unnecessary travel, optimizing

energy utilization, and improving harvesting throughput in vertical farming systems. Unlike existing studies that mainly emphasize navigation or crop production, the presented work integrates AMR navigation, vertical lifting operations, robotic manipulation, charging events, and unloading cycles into a unified energy-aware harvesting logistics framework. The study establishes a foundation for future simulation-based optimization and intelligent energy management for autonomous indoor farming applications.

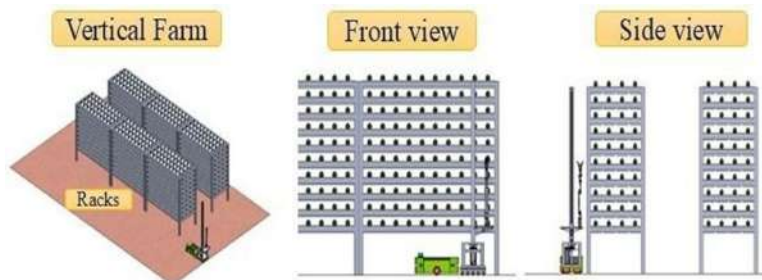


Figure 1: Layout of a vertical farm with multi-tiered growing racks

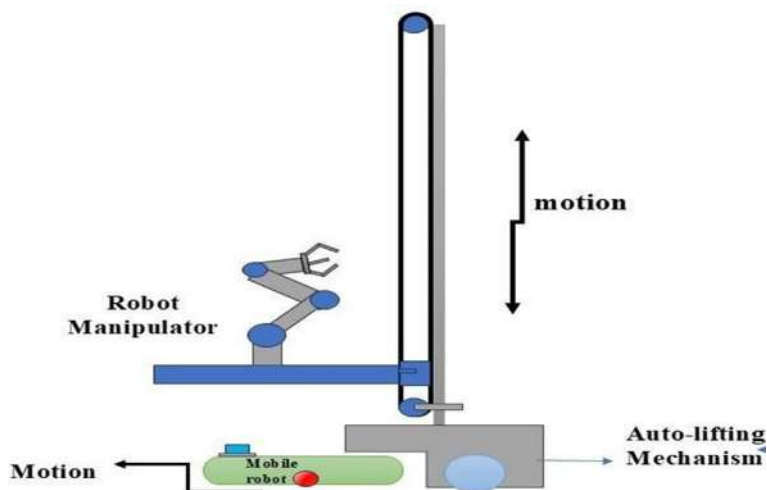


Figure 2: AMR integrated ALM in Vertical farming

Presenter:

Priyanka Verma

Indian Institute of Technology Ropar, India



Effects of Heat Treatment on Plasma-Sprayed Indian Clam Seashell-Derived Hydroxyapatite (HA) Coating Applied on Ti-Alloy

Kazi Sabiruddin

Professor, Department of Mechanical Engineering
Indian Institute of Technology Indore (IIT Indore), India

Hydroxyapatite (HA) powder is synthesized from Indian clam seashells. Then the spray-dried seashell-derived HA powder is sprayed by atmospheric plasma spray technique on Ti-alloy (Ti-6Al-4V ELI) substrate, and further the as-sprayed HA coating is heat-treated in a muffle furnace at different temperatures of 500, 600, 700, 800, and 900°C for a 2 h of holding time under normal atmospheric conditions, followed by furnace cooling. Heat-treated and as-sprayed coatings are characterized to examine and study the effects of heating temperature on the physical, mechanical, and tribological properties of the coatings. A suitable heating condition is tried to find through this investigation. The phases and microstructure of the as-sprayed and heat-treated coatings are analyzed by XRD and FESEM techniques respectively. Average surface roughness, microhardness, and wear behavior are estimated through the stylus profilometer (contact-type), Vickers microhardness tester, and linear reciprocating tribometer, respectively. The transformation of the secondary phase such as CaO into the primary HA phase is noticed after heat treatment. Due to increased crystallinity and crystallite size, the volumetric expansion of limitedly spread HA splats is noticed at high heating temperatures. As a result, a relatively smoother coating surface is obtained. Also, at higher heating temperatures, the coating hardness is increased due to the reduction in coating porosity and improvement in the crystallinity. However, beyond 700°C of heating temperature, the cracks have started to form and increase in number with an increase in heating temperature. The improved tribo-mechanical properties are obtained when the heating temperature of the HA coating is kept at 800°C.

Presenter:

Kazi Sabiruddin

Indian Institute of Technology Indore (IIT Indore), India



Building Smart Circular Economies through Industry 4.0 Technologies: Evidence from South Asia

Narayanage Jayantha Dewasiri¹ and **Mananage Shanika Hansini Rathnasiri²**

¹Faculty of Management Studies, Sabaragamuwa University of Sri Lanka, Sri Lanka | University Centre for Research and Development (UCRD), Chandigarh University, India

²College of Society and Professions, London South Bank University, UK

The combination of Industry 4.0 (I4.0) technologies and Circular Economy (CE) principles is an effective way towards sustainable development, especially in emerging economies. This paper examines the enablers and challenges to the development of smart circular economies in South Asia, with a focus on India, Sri Lanka, and the Maldives.

This qualitative research design employed in-depth interviews with 15 stakeholders from the manufacturing, agriculture and tourism sectors. Six key dimensions influenced the transition: digital readiness, enabling factors, integration barriers, sectoral circular practices, consumer behaviour, and sustainability performance.

The results show that although awareness of circular economy practices and digital technologies is increasing, their integration is hampered by high implementation costs, limited digital infrastructure, policy fragmentation, and limited technical expertise. However, critical enablers such as public-private partnerships, international collaboration, donor support, and regulatory alignment can go a long way toward accelerating adoption.

The study also identifies sectoral differences, where Indian manufacturing and Maldivian tourism are more digitally mature than Sri Lankan agriculture, which is more fragmented in its adoption. Importantly, the research highlights the growing role of digital tools in improving resource efficiency, waste management, and sustainability monitoring, which are key aspects aligned with global recycling and sustainable waste management agendas.

This study contributes to the emerging discussion on smart circular economies by providing cross-country, cross-sector insights and policy and managerial implications for accelerating digitally enabled sustainability transitions in developing regions.

Presenter:

Narayanage Jayantha Dewasiri

Sabaragamuwa University of Sri Lanka, Sri Lanka | University Centre for Research and Development (UCRD), Chandigarh University, India



Reverse Logistics and Environmental Sustainability of Fast-Moving Consumer Goods Companies in Nigeria

J. C. Nwaulune

Department of Business Administration and Marketing
School of Management Sciences, Babcock University, Nigeria

Environmental sustainability is a major concern for fast-moving consumer goods (FMCG) companies, as their production and distribution processes significantly impact the environment. Various initiatives have been implemented to promote sustainability by minimizing waste and pollution. However, in Nigeria, these efforts may have failed to achieve the intended results, as seen in the worsening environmental sustainability situation. This decline is primarily due to poor performance in reverse logistics, including ineffective waste management and inefficient product return systems, which result in environmental harm, such as pollution and waste buildup. Thus, this study investigated the effect of reverse logistics on the environmental sustainability of FMCG companies in Nigeria. The study adopted a survey research design. The study population comprised 13,782 management employees from eight quoted FMCG companies in Nigeria. The sample size of 519 was determined using Taro Yamane's formula. A simple random sampling technique was used in selecting respondents. "A structured and validated questionnaire was used for data collection, with Cronbach's alpha reliability coefficient for the constructs ranging between 0.78 and 0.94. The response rate was 96.7%. Data were analyzed using descriptive and inferential statistics (multiple and hierarchical regression). The findings revealed that reverse logistics had a significant effect on the environmental sustainability of selected FMCG companies in Nigeria ($Adj.R^2 = 0.476$, $F(4, 495) = 114.475$, $p < 0.05$). The study concludes that reverse logistics influenced environmental sustainability among selected fast-moving consumer goods companies in Nigeria. Therefore, it is recommended that management of FMCG companies in Nigeria and similar contexts prioritize the development and implementation of robust reverse logistics systems. This includes investing in technologies like Reverse Logistics 4.0, fostering inter-organizational collaboration to optimize waste management, and encouraging recycling and remanufacturing initiatives to enhance environmental sustainability.

Presenter:

Jude Chekwume Nwaulune
Babcock University, Nigeria



Multi-Sensor Earth Observation for Remote Large Eruption Monitoring: The 2025 Erta Ale–Hayli Gubbi Eruption (Ethiopia)

**Maria A. Marsella¹, Matteo Cagnizi¹, Mauro Coltelli²,
Matteo Gallo¹ and Francisco Guerrero Tello²**

¹Sapienza University of Roma, Italy

²INGV, Italy

The continuous monitoring of active volcanic systems remains a significant challenge in Earth observation for natural hazards. Volcanic eruptions are complex processes that unfold over varying timescales, from gradual pressure buildup in magmatic systems to rapid morphological changes during eruptions. This thesis presents a multi-sensor Earth Observation framework to monitor the remote Erta Ale–Hayli Gubbi volcanic system in Ethiopia's harsh and inaccessible Danakil Depression. By integrating radar, optical, and atmospheric data with an innovative Artificial Intelligence pipeline, the study offers a comprehensive, automated approach to mapping volcanic features, analyzing deformation, tracking SO₂ emissions, and documenting morphological changes, ultimately providing a quantitative and replicable narrative of the system's evolution. This work focuses on developing an AI pipeline for automatically segmenting key volcanic morphological features. It begins by creating diverse annotation masks across multiple dates and contexts to build a robust dataset for training. The pipeline covers dataset preparation, tiling, geographical splits, data augmentation, class imbalance handling, model training, evaluation using metrics like IoU and Dice, and error analysis. The output includes georeferenced thematic maps for GIS integration, enabling temporal comparisons and application to other volcanic systems, with analyses spanning multi-temporal annual trends and event-specific dynamics for comprehensive insights into volcanic evolution.

Presenter:

Maria A. Marsella

Sapienza University of Roma, Italy



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DAY 02



5th GLOBAL SUMMIT ON

ADVANCES IN EARTH SCIENCE AND CLIMATE CHANGE

SEPTEMBER 24-25, 2026 | LONDON, UK

SPEAKER TALKS



When the Frame No Longer Fits: Learning to Adapt in Climate and Earth Science Decisions

Adrian Wolfberg

Case Western Reserve University, USA

Climate change is often described through data, models, projections, and physical impacts. Yet one of the most important challenges is how leaders and organizations interpret what those changes mean as conditions evolve. This presentation examines climate change as a framing challenge: a problem whose meaning shifts across physical, social, economic, political, and security domains. A coastal flooding issue, for example, may begin as an infrastructure concern, become a public health and displacement concern, and later affect governance, trust, and national security. Drawing from my two recent books, *Who Leads When AI Thinks?* and *Climate Security Intelligence*, the presentation introduces adaptive learning as a practical capability for improving climate decision-making. It uses four learning modes: cooperative, focused, survival, and reflective learning, to show how individuals and organizations absorb information under different conditions of clarity, ambiguity, overload, and pressure. Each mode can improve framing and reframing when used well, but each can also distort understanding when it no longer fits the situation. The presentation also uses a climate security framing mechanism that distinguishes intentional and unintentional sources of harm, along with tangible and intangible effects. This helps explain why climate problems are difficult to interpret and why improved science alone does not automatically produce improved decisions. The central argument is that climate adaptation depends not only on better information, but on the ability to learn across knowledge boundaries, changing conditions, competing interpretations, and different time horizons. Learning across these boundaries is important because climate problems rarely stay inside one discipline, agency, sector, or decision frame.

Presenter:

Adrian Wolfberg

Case Western Reserve University, USA



Hydrogen-Based *In-Situ* Reduction of Pyrite Cinder for Iron Recovery

Yongliang Wang

University of Emergency Management, China

Pyrite cinder (PyC), an iron-enriched industrial solid waste generated from sulfuric acid production, has great potential for iron recovery. However, the presence of hazardous trace metals hinders its effective utilization. In this study, a hydrogen-based *in-situ* reduction method was investigated as a pre-treatment strategy to promote iron metallization, with a particular focus on the migration of Cu, As, Zn and Pb. The effects of key parameters including reduction temperature, hydrogen flow rate and reaction time, were systematically investigated. The results demonstrated that raising the reduction temperature is beneficial for the reduction of iron oxides, and the metallization extent of iron can reach 89.98% under optimal conditions. Simultaneously, the Pb, Zn, and As impurities were effectively volatilized and partially removed in the form of oxides, sulfides and metal phases, accompanied not only by reduction reactions but also volatilization, and gas-phase reactions. However, surface sintering occurs when the temperature exceeds 900°C, which is not conducive to the *in-situ* iron reduction. This study provides a feasible hydrogen-based approach for the pre-treatment of pyrite cinder, promoting iron metallization and the removal of hazardous elements, with potential benefits for subsequent resource recovery and utilization.

Presenter:

Yongliang Wang

University of Emergency Management, China



Balancing Tourism Expansion and Ecosystem Sustainability: Experiences from Goa's Coastal Destinations (India)

Nandkumar Sawant¹ and **Ventakesh Prabhugaonkar²**

¹Professor & Head, Department of Geography and Research Center, Parvatibai Chowgule College (Autonomous), India

²Assistant Professor, Department of Geoinformatics Government College of Commerce and Economics (Autonomous), India

Coastal tourist destinations, particularly in tropical regions, are globally renowned for their allure of sun, sand, and sea. Tourism, as one of the fastest-growing sectors, has brought significant economic prosperity and employment opportunities; however, it has also caused adverse impacts on the environment and local communities over time. Coastal tourism in Goa, India, has seen a substantial influx of visitors over the decades, with the 21st century witnessing unprecedented growth, leading to numerous consequences. This highlights the necessity of revisiting and reassessing tourism development to ensure sustainability.

Focusing on Calangute, Baga and Anjuna, iconic coastal tourist hotspots in Goa - India, this research evaluates the current stage of tourism development and explores the resulting land transformation and changes in Land Use and Land Cover (LULC). These changes have profoundly influenced the coastal landscape, ecology, and microclimate, leading to challenges for coastal ecosystems. The research applies Butler's Tourism Area Life Cycle (TALC), which outlines six predictable growth stages: discovery to stagnation, and either decline or rejuvenation. Geospatial techniques, combined with advanced predictive modeling, are utilized to analyze changes in LULC, land surface temperature, and other environmental parameters. Formulas have been employed to calculate surface radiance, brightness temperature, NDVI (Normalized Difference Vegetation Index), vegetation proportion, land surface emissivity, and land surface temperature. Further, a change matrix and predictive analysis were conducted, incorporating the Markov Chain Model (CA-Markov) to assess spatial dynamics and project future trends.

The findings suggest that tourism in Calangute and Anjuna has reached the final stage of TALC, signifying a considerable shift in land use—from agriculture and green spaces to urbanized and commercial areas. These changes have impacted the coastal ecosystem, contributing to landscape transformation, microclimate alterations, and a notable rise in temperature, high-

lighting the implications of climate change. Additionally, these destinations have exceeded their carrying capacity, further stressing the fragile coastal ecosystem. Although these destinations have reached a peak in terms of development, intervention strategies and planned, sustainable measures can help rejuvenate and preserve these tourist attractions for future generations.

Presenter:

Nandkumar Sawant

Parvatibai Chowgule College (Autonomous), India



Advances in Soil Carbon Monitoring and Management: Tools and Strategies for Climate-Smart and Sustainable Agriculture

Shivali Boregowda Yogananda¹, Morasanahalli Lokesha Sachin¹, Pruthviraj², Kondavenakapalli Muninarayanappa Pravalika¹ and Mallavalli Nagaraju Roopa³

¹University of Agricultural Sciences, Mandya, India

²BEST Innovation University, India

³Indian Agricultural Research Institute, New Delhi, India

Soil carbon is an essential aspect of ecosystem health, acting to alter nutrient cycling, agricultural yields, and climatic regulation through carbon dioxide sequestration from the atmosphere in stable organic moieties. To measure current stocks, define the distribution of soil carbon in space and depth, and create efficient management strategies, precise soil carbon characterisation is necessary. This aims to address the current fragmentation in methods and practices across agroecosystems, attempts to summarise recent developments in soil carbon monitoring tools and critically assess soil carbon management strategies that improve carbon sequestration and support climate-smart agriculture. High-resolution proximal sensing, remote and satellite-based digital soil mapping, and gamma-ray spectroscopy have transformed monitoring with quick, spatially explicit, and field-scale data, even though more traditional techniques like dry combustion and wet chemical analysis are still crucial. Conservation tillage, cover crops, varied crop rotations, and organic manures are examples of soil carbon opportunity areas that work together to improve the soil's fertility, structure, and ability to withstand erosion. Long-term sequestration can also be accomplished by innovative technologies, such as the use of biochar and precise nutrient delivery, as well as land-use planning, such as the conversion of degraded soils to perennial crops. Notwithstanding these advantages, regional heterogeneity, the reversibility and slowness of the sequestration process, and the requirement for further implementation of the best practices present certain difficulties. A preferred strategy to raise soil carbon levels, support sustainable food security and agriculture, and lessen global climate change is to include modern evaluation tools with enabling policies, capacity building, and incentive mechanisms like carbon credits.

Presenter:

S. B. Yogananda

University of Agricultural Sciences, Mandya, India



Integrating GIS and Remote Sensing for Spatial Distribution Assessment of Drought Vulnerability Index

Jehan M. Sheikh Suleimany¹, Hasan Mohammed Hameed² and Aad Rasul³

¹Department of Water Resources Engineering, College of Engineering, Salahaddin University, Iraq

²Department of Civil and Environmental Engineering, Faculty of Engineering, Soran University, Iraq

³Department of Geography, Faculty of Arts, Soran University Iraq

Hydrological drought is a critical factor affecting ecosystems and water availability in semi-arid regions. This study evaluates hydrological drought conditions in the Greater Zab watershed using the Drought Vulnerability Index (DVI). The methodology integrates Geographic Information System (GIS) and remote sensing techniques with a Multi-Criteria Decision Analysis (MCDA) approach. Specifically, the Analytic Hierarchy Process (AHP) is employed within the DVI framework to evaluate the spatial distribution of hydrological drought vulnerability across the watershed. The analysis incorporates various hydrological, topographical, and environmental criteria, including temperature, precipitation, solar irradiation, slope, the Normalized Difference Water Index (NDWI), the Topographic Wetness Index (TWI), land cover, soil types, and stream networks. These criteria were selected due to their significant influence on hydrological drought conditions. The results indicate that 55.7% of the watershed exhibits low to moderate vulnerability to hydrological drought. Conversely, 15.5% of the area exhibits very low vulnerability, indicating regions minimally affected by hydrological drought hazards. However, the southern portion of the watershed displays a higher susceptibility to hydrological drought, with 28.8% of the area classified as experiencing high to very high levels of hydrological drought. These zones are particularly vulnerable due to the combined effects of climate change, distinctive topographical features, increasing temperatures, and decreasing precipitation.

Presenter:

Jehan Momammed Sheikh Suleimany

Salahaddin University, Iraq



Assessing the Systemic Effects of the Bordeaux Low Emission Zone (LEZ) Using the SIMUTEC Platform

Seghir Zerguini¹, Simon Gorecki² and Nathalie Gaussier¹

¹Bordeaux School of Economics (BSE) - University of Bordeaux
France

²IMS - University of Bordeaux, France

In France, the Climate and Resilience Act (2021) requires urban areas with more than 150,000 inhabitants to implement Low Emission Zones (LEZ) in order to restrict access to city centres for the most polluting vehicles. By 2025, 43 urban areas are affected, including the Bordeaux metropolitan area, which is selected here as a case study.

This paper relies on the SIMUTEC systemic simulation platform to analyse the transformations induced by the implementation of a LEZ on the mobility system and, more broadly, on the socio-spatial dynamics of the metropolitan area. The model explicitly represents households (socio-economic characteristics, residential location, constraints and preferences), their travel behaviours, and the associated vehicle fleet. It enables the exploration of LEZ implementation scenarios based on the progressive replacement of banned vehicles by electric vehicles, while accounting for impacts on mobility costs and access to urban opportunities.

We assess, on the one hand, the direct effects of the LEZ on reductions in CO₂ emissions and local air pollutants generated by road traffic, and, on the other hand, the indirect and systemic effects on relocation dynamics, residential trade-offs, and inequalities in accessibility. Particular attention is paid to low-income households, which are more car-dependent and have limited access to “clean” vehicles in the absence of financial support, as the cost of an electric vehicle remains on average 50% higher than that of a conventional internal combustion vehicle.

The contribution discusses the potential and limitations of a systemic simulation approach to provide integrated insights into the environmental and social impacts of urban mobility decarbonisation policies, as well as the spatial justice issues associated with the implementation of LEZ.

Presenter:

Seghir Zerguini

University of Bordeaux, France



Influence of Ageing and Siltation on the Seismic Responses of Arch Dams

Deepa Balakrishnan¹ and Rinku John²

¹Professor, School of Engineering, Cochin University of Science and Technology, India

²Research Scholar, School of Engineering, Cochin University of Science and Technology, India

India has a large number of dams that play a crucial role in irrigation, hydro-power generation, flood control, and water supply. Nearly half of these dams are more than 25 years old, and many are approaching the end of their original design life. Stability and seismic performance of Concrete arch dams are influenced by long-term deterioration under harsh environmental conditions. Ageing of the dam body is a matter of concern to this partially submerged structure as it can bring about substantial changes in the material properties and subsequent responses to time-varying external loads coupled with environmental effects. Reservoir sedimentation which reduces storage capacity is another concern particularly in older or thin concrete dams since it severely impacts the stability and structural integrity of dams by altering the forces acting on the structure through increased pressure on dam walls, accelerated structural wear, and potential failure. Dynamic responses of the subdomains of the dam system during seismic excitation are influenced by parameters particularly, dam-reservoir-foundation interactions, reservoir sediments, characteristics of earthquake input etc., which leads to a complex damage mechanism.

This research work tries to highlight the implications of ageing and reservoir siltation on the dynamic responses of Idukki arch dam under earthquake excitations with varying frequency content using finite element model of the dam-reservoir-foundation system developed in ANSYS software. The age is considered at 1, 50 and 100 years to evaluate the time history responses under earthquake loadings with low, medium, and high frequency content. The dynamic responses which are evaluated in terms of Demand Capacity ratio (DCR) and Cumulative Inelastic Duration (CID) based on linear time history analysis at the upstream face of the dam indicate that there is severe variation in the responses with age due to material degradation. The findings emphasize the importance of incorporating sedimentation effects in the safety assessment of dams to ensure sustainable reservoir management and long-term structural reliability.

Presenter:

Deepa Balakrishnan S

Cochin University of Science and Technology, India



A Simple Overview of Virtual Machine (VM) Consolidation Techniques for Green Cloud Computing

Mamatha G.S

Professor & Head of the Department in Information Science and Engineering, RV College of Engineering, India

The fierce growth of cloud computing has already triggered a concerning surge in energy consumption by data centers, signaling a substantial menace to environmental sustainability. Green cloud computing emerges as an important paradigm shift, aiming to diminish this impact by optimizing resource utilization and minimizing energy consumption. This paper explores Virtual Machine (VM) consolidation as a crux of green cloud computing, offering a panoramic analysis of its potential to curtail energy consumption and enhance resource efficiency in data centers.

This study meticulously determines various VM consolidation techniques, having both static and dynamic approaches, while delving into their advantages and limitations. It explores the capability of these techniques to reduce energy consumption, improve resource utilization, reduce operational costs. In addition, the paper investigates the barriers associated with VM consolidation, such as performance degradation, security concerns and increased server downtimes, while advocating potential mitigation strategies.

Furthermore, this research delves into latest trends and advancements in VM consolidation, focusing on innovative approaches determined to excel efficiency. It explores strategies that leverage adaptive methods and intelligent systems to optimize resource allocation while improving overall performance.

The conclusion emphasizes the indispensable role of VM consolidation in attaining green cloud computing goals which is vital for sustainability and proposes future research paths, including the development of optimization algorithms, leveraging AI and ML for optimized VM consolidation strategies and enhancing VM migration techniques. Lastly this research enriches to growing body of knowledge on green and sustainable cloud computing, paving a way for greener and more energy efficient era to come.

Presenter:

Mamatha G S

RV College of Engineering, India



Packaging Industry in India – A Paradigm Shift towards Sustainability

Smita Salunke

Associate Professor, Akbar Peerbhoy College of Commerce & Economics, India

According to a United Nations Environment Programme (UNEP) report, India is the fifth-largest producer of plastic waste worldwide, producing an estimated 9.46 million tons annually. Plastic is a major component of packaging materials. Packaging waste in India has significantly increased pressure on the landfills of most major cities, driven primarily by the e-commerce and consumer goods sectors. There is no direct national estimate of the annual share of India's total landfill volume attributable to packaging waste, as landfill composition data vary by city and are not centrally recorded by volume. Globally, problems associated with packaging waste are numerous, and the situation is worsening as such waste disrupts and degrades terrestrial, aquatic, and marine ecosystems, thus threatening biodiversity. Without an effective recycling system, this material becomes a persistent pollutant, eventually disrupting ecological balance.

Against this backdrop, the study examines India's paradigm shift towards sustainable packaging, driven by tighter regulations, changing consumer preferences, and industry innovation. The methodology is based on a secondary analysis of policies, reports, and case studies from across the country's urban ecosystem, the CPCB EPR Portal, and waste reports of the municipal corporations of the major metros.

India's sustainable packaging market is estimated at about USD 10.2 billion in 2025 and is projected to reach around USD 17.7 billion by 2034. Indian cities are increasingly adopting sustainable packaging through local bans, corporate pilots and start-ups aligning with national ERP rules and plastic bans.

Several companies are involved in the development of sustainable packaging solutions. Some of which are mentioned below:-

Company	Location	Key Products	Notes
Green Bio	Kerala	PLA water bottles, caps/labels	100% biodegradable in 3 months; for tourism
Beco	Mumbai	Bamboo pulp bags, towels	Available in 1,500+ Mumbai stores.
Ecoware	India	Bagasse tableware, takeaway packs	Pioneered plant-based in 2010.
Pakka	Ayodhya	Sugarcane compostable tableware	Backyard compostable.
Bambrew	Bengaluru	Bamboo pulp bags/boxes	Plastic-free for e-commerce/FMCG.

Presenter:
Smita Salunke
Akbar Peerbhoy College of Commerce & Economics, India



Sound Insulation and Mechanical Characterization of Recycled Rubber Panels for Sustainable Building Applications

Anđelko Crnoja

Department of Civil Engineering, University North, Croatia

Recycled rubber from automotive tires represents a significant environmental challenge worldwide, with millions of end-of-life tires disposed annually through landfills and incineration, practices associated with toxicological risks from leaching of PAHs and significant loss of a valuable elastomeric resource. This research explores the transformation of recycled rubber granulate from automobile tires into functional sound insulation panels for sustainable construction applications, addressing waste valorization and the growing demand for lightweight, high-performance construction materials. Composite panels incorporating crumb rubber as a substitute for fine aggregate are manufactured with different particle size compositions, thicknesses and densities, and are then subjected to comprehensive sound insulation and mechanical testing. Sound insulation characterization included sound reduction index and absorption coefficient measurements across the sound frequency spectrum, revealing that increased rubber content improves low frequency sound insulation performance, with panel thickness and density identified as key influencing parameters. Mechanical tests focused on the behavior of the elastic modulus, showing a strong dependence on the strain level and loading history; the initial modulus proved to be suitable only for an approximately linear response region, which prompted the definition of initial, secant and tangent modulus parameters that are more representative of the actual behavior of the material under load. These parameters were formulated for direct integration into numerical models of lightweight structures and sound insulation systems. Compared to conventional insulation materials such as mineral wool and polymer foams, recycled rubber panels showed competitive sound insulation performance, while offering clear environmental and circular economy benefits by diverting waste rubber from landfill. Future work will explore hybrid composites combining rubber with agricultural waste aggregates and the development of simplified nonlinear models for practical engineering applications. This research contributes to the advancement of recycled materials as viable, functional solutions in sustainable construction and noise control engineering.

Presenter:

Anđelko Crnoja, University North, Croatia



Seismic Risk in the Chlef Region: Evaluation of Road Network Risk Interruption

Zohra Boutaraa

Civil Engineering & Architecture Institute
Hassiba Benbouali University of Chlef, Algeria

The Chef region, situated in the lower Chelif Basin in Algeria, is renowned for its history of seismic activity. Several seismic events have occurred there in the last century and have been studied and documented. Notable events include the major earthquakes that struck El Abadia (formerly Carnot) on September 7, 1934 ($M_s = 5.1$), Oran on September 9, 1954 ($M_s = 6.9$), and El Asnam on October 10, 1980 ($M_s = 7.3$). This seismic activity is due to the region's seismological context, characterised by the presence of multiple faults. Therefore, studying the seismic vulnerability of structures such as buildings, roads, bridges, and tunnels is important for enhancing their resilience to earthquakes. This study builds on previous seismic hazard studies in the region, evaluating the seismic vulnerability of the main road axis using the SYNER-G method. Additionally, the study proposes a simplified methodology for estimating and mapping seismic risk disruption to the road network in the municipality of Chlef, the region's main city. The proposed methodology considers different parameters, such as the soil nature and its vulnerability to seismic-induced effects, the road obstruction by the debris of a collapsed building, or by the collapse of a bridge. A GIS tool was used to map the results. The study's primary objective is to map the risk of road network interruption and indicate the likely affected areas. This map can be used by local road infrastructure managers, the military, and seismic risk managers to help them avoid obstructions or damage to roads in the immediate aftermath of an earthquake.

Presenter:

Zohra BOUTARAA

Hassiba Benbouali University of Chlef, Algeria



Techno-Economic Analysis of Bio-Solar Green Roofs for Urban Heat Island Mitigation and Building Energy Performance in Pakistan

Azhar Iqbal and **Shoaib Rauf**

University of Gujrat, Pakistan

Urban heat islands (UHI) increase cooling load and reduce the performance of rooftop PV systems, co-benefits of integrated bio-solar green roofs require quantification and real-world demonstrations to inform the uptake of technologies. Consequently, this study compares the thermal and electrical performance of four co-located roof assemblies such as conventional roof (CR), green roof (GR), Photovoltaic roof (pCR) and bio-solar green roof (pGR) under clear-sky summer periods in Lahore, Pakistan. This research guides the design that would maximize UHI mitigation while enhancing building energy performance. The experiment equipped the same insulated test cells with meteorological, thermal, moisture, and PV power gauging at 1-min data, and standardized layers were built, and the PV tilt was set at 22°; data were quality checked and brought to hourly statistical values. Thermal Performance Index was compared using damping factor, time lag and a composite Thermal Performance Index (TPI). Results show pGR always has a better performance compared to others: the temperature on the outer surface is lower, the diurnal amplitude is most attenuated ($\Delta DF \approx +19\%$ vs CR), the thermal response is most delayed ($\Delta TL \approx -21\%$), and TPI is improved by $\sim 6.5\text{--}7\%$. Peak heat-flux on the inside reduces from $\sim 120\text{--}125 \text{ W m}^{-2}$ (CR) to $\sim 70\text{--}80 \text{ W m}^{-2}$ (pGR), reducing day-in day-out heat gain by $\sim 39\text{--}41\%$ ($\sim 0.39\text{--}0.40 \text{ kWh m}^{-2} \text{ day}^{-1}$). PV yield is also increased slightly in the case of pGR ($\approx 1\text{--}2\%$) because of lower module temperatures; cumulative avoided heat is about $\sim 2.3\text{--}2.4 \text{ MJ m}^{-2}$ per day, which is front-loaded along the afternoon peak. The maximized synergy is certified by a Bio-Solar Coupling Index at the irradiance of less than 675 W m^{-2} . All these results indicate a new field-tested synergy between evapotranspiration and PV shading/ventilation that could be converted into practical value as reduced peak cooling loads (demand control), lower day-to-day cooling energy, and incremental PV gains. These are critical factors to positive techno-economics in hot sunny cities aimed at UHI mitigation and resilient building energy systems.

Presenter:

Azhar Iqbal

University of Gujrat, Pakistan



Curriculum Design and the Integration of Sustainability - The Case of Reorganized Master Programs

Martin Wenke

Hochschule Niederrhein University of Applied Sciences
Germany

To fully integrate sustainability into education, a holistic approach is necessary, rather than just creating specialized sustainability degrees. This requires a fundamental revision and adaptation of existing programs. This paper describes the curriculum design process of two programs, a general master program in business management and another one in international management, both focusing on integrating sustainability into the renewed curriculum. Using research on education for sustainable development (ESD), several starting points for incorporating sustainability into the curriculum were identified, including mandatory sustainability topics for all students as “sustainability anchors”, electives like sustainable supply chain management and sustainability marketing, and experiential learning opportunities to foster students’ sustainability competence. The curriculum design process involved multiple stakeholders, including students, teachers, alumni, companies, university administration, and peer groups, to ensure participation and engagement. The paper describes the process, identifies process-related challenges and ideas for solutions to the curriculum design process in management education. Additionally, it shows the current curricula of both programs and discusses the practical integration of sustainability. That will be done based on 2 examples: The first shows the experiences with modules “Business Economics” and “Business Ethics and CSR”, interconnected by addressing common sustainability challenges of businesses from the economic and the environmental and societal sustainability point of view. The second one offers details, how the topic of AI and sustainability are addressed in an international intensive workshop with 4 partner universities. Furthermore. It concludes with reflections on the role of interactive, project-based, learner-centered pedagogy in education for sustainable development, contributing to the field of ESD.

Presenter:

Martin Wenke

Hochschule Niederrhein University of Applied Sciences, Germany



From Surplus Power Valorization to Hydrogen-Based Turbine Decarbonization in Industrial Gas Turbogenerators

Juan Fernando Cadavid¹, David Patiño-Ruiz¹, Manuel Saba², Oscar E. Coronado-Hernández³, Rafael D. Méndez-Anillo⁴ and Alejandro Martínez-Amariz¹

¹Faculty of Engineering and Technologies, Universidad de Santander (UDES), Doctoral Program in Renewable Energy Resources, New Technologies Research Group (GNT), Colombia

²Civil Engineering Department, Universidad de Cartagena Colombia

³Instituto de Hidráulica y Saneamiento Ambiental, Universidad de Cartagena, Colombia

⁴Escuela de Ingeniería, Arquitectura & Diseño, Universidad Tecnológica de Bolívar, Colombia

This work presents an integrated industrial decarbonization pathway that links surplus electricity valorization through alkaline water electrolysis with the future thermodynamic use of hydrogen in industrial gas turbogenerators. The objective is to demonstrate how structurally available excess power in a self-generation scheme can be converted into a strategic hydrogen platform and, in a second research stage, used to support hydrogen/natural gas blending in turbine operation. The scope of the study is a Colombian oil-field Central Processing Facility equipped with two natural-gas turbogenerators of approximately 20 MW each operating under real field conditions. The methodology combined analysis of more than 31,000 operating records of gas consumption and active power, physicochemical characterization and treatment of produced water, comparative techno-economic assessment of alkaline and PEM electrolysis, and scenario-based hydrogen production and financial evaluation. Results showed a structurally stable electrical profile with continuous surplus windows that favor alkaline water electrolysis under the asset's operating conditions. The proposed treatment train achieved projected water quality compatible with industrial alkaline electrolysis, with conductivities at or below 5 $\mu\text{S}/\text{cm}$. Hydrogen production scenarios between 1.5 and 10 MW yielded estimated outputs from 0.5 to 3.5 t H₂/day, with electricity-to-hydrogen efficiencies above 70%. The economic assessment identified a techno-economic threshold near 3 MW and the strongest performance in the 6.5–10 MW range. In conclusion, surplus electricity valorization through alkaline electrolysis is technically feasible, economically attractive, and environmentally relevant for industrial self-generation systems. In ad-

dition, it provides a validated practical foundation for ongoing doctoral research aimed at formulating a modified Brayton-cycle equation for progressive H₂/NG blending in industrial gas turbines.

Presenter:

Juan Fernando Cadavid Montoya

Universidad de Santander (UDES), Doctoral Program in Renewable Energy Resources, New Technologies Research Group (GNT), Colombia



Keto-enol Insecticides Disrupt Ovarian Wnt/ Armadillo Signaling and Redox Balance, Inducing Generational Toxicity in *Drosophila melanogaster*

María Elena Calderón-Segura¹, Berenyce González-Marín¹, José Pedraza-Chaverri², Omar Noel Medina-Campos², Edmundo Bonilla³, Hilda Zamira Vilchis-González¹ and Mauricio Reyes-Acuña¹

¹Environmental Toxicology Laboratory, Department of Biosphere-Atmosphere, Institute of Atmospheric Sciences and Climate Change, Universidad Nacional Autónoma de México Mexico

²Department of Biology, Faculty of Chemistry Universidad Nacional Autónoma de México, Mexico

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This study evaluated Wnt/armadillo signalling pathway activity in the germarium of Fz3-RFP transgenic and wild-type (*Oregon R*) *Drosophila melanogaster* females orally exposed to sublethal concentrations of the keto-enol insecticides Movento® 240 SC (0, 11.2, 22.4, 37.3 mg/L) and Envirdor® 240 SC (0, 12.3, 24.6, 41.1 mg/L) for 72 hours using immunofluorescence. Both insecticides induced irregular overexpression of the Wnt/armadillo pathway in regions 1 and 2a of the germarium,. This effect was accompanied by morphological alterations, tissue disorganization, and reduced cell count compared to the control groups. Concurrently, oxidative stress was detected in all ovaries by measuring malondialdehyde (MDA) levels and the antioxidant enzyme activities of superoxide dismutase (SOD) and catalase (CAT) *via* UV spectrophotometry following insecticide exposure. Movento® 240 SC and Envirdor® 240 SC significantly increased MDA (0.32–0.78 and 0.21–0.57 nmol mg⁻¹ protein) and enzymatic activities of CAT (0.16–0.20 and 0.13–0.15 U mg⁻¹ protein) and SOD (0.40–0.69 and 0.19–0.54 U mg⁻¹ protein), respectively, relative to the control groups. Additionally, oviposition and hatching rates were evaluated in eggs from exposed females mated with males unexposed to insecticides, alongside larval development (L1, L2, L3). Oviposition and hatching rates decreased by 22–62% with Movento and 47–86% with Envirdor. Larval progression from L1 to L3 was delayed, with reductions of 30–97%. Furthermore, 60% of L1 larvae from females exposed to 22.4 and 37.3 mg/L Movento® 240 SC and 24.6 and 41.1 mg/L Envirdor® 240 SC exhibited locomotor defects, including reduced head-thrust intensity, body curling, and di-

minated burrowing behavior. This study provides clear evidence of multiple toxic effects on the female reproductive system and the larval development of *Drosophila melanogaster*, exposed to the keto-enol insecticides Moven-to® 240 SC and Envidor® 240 SC.

Presenter:

María Elena Calderón-Segura

Institute of Atmospheric Sciences and Climate Change, Universidad Nacional Autónoma de México, Mexico



Study of Groundwater Quality and Its Human Health Risk Assessment to Population Exposed in the Region of Nimar, Madhya Pradesh, India

Devaanshi Jagwani¹ and **Jai Rathore²**

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Institute of Engineering and Science, Indore, India

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Institute of Engineering and Science, Indore, India

Groundwater is a vital source of drinking water across Madhya Pradesh, fulfilling over 90% of domestic needs. In Khargone district, the aquifer system is classified as overexploited, with rising concerns over water quality degradation. This study presents a comprehensive hydrochemical and human health risk assessment of 350 groundwater samples from 59 locations in the Nimar region. Physicochemical parameters—including nitrate, fluoride, hardness, and total dissolved solids—were analyzed per BIS and WHO standards. Principal Component Analysis (PCA), Cluster Analysis, and Piper diagrams revealed dominant Ca–Mg–HCO₃ facies with localized transitions to Na–Cl regimes, indicating both geogenic and anthropogenic influences. Human Health Risk Assessment (HHRA) highlighted nitrate as the primary non-carcinogenic risk factor; 42 borewells exceeded permissible NO₃⁻ levels, and two sites exhibited co-contamination with fluoride, suggesting compounded health hazards such as methemoglobinemia and fluorosis. The calculated Water Quality Index (WQI) of 81.91 categorized groundwater as moderately polluted, requiring treatment prior to consumption. This study presents an innovative, multidisciplinary approach to groundwater assessment in Khargone district, combining hydrochemical analysis, geostatistical processing, and public health risk evaluation. The study demonstrates a robust framework for groundwater safety assessment in agriculturally intensive and semi-arid regions. It emphasizes the role of seasonal facies shifts, land use practices, and geological controls in shaping water quality, informing targeted remediation strategies and sustainable resource management. This integrative methodology holds translational potential for water security policy and regional planning across similar geo-hydrological settings.

Presenter:

Devaanshi Jagwani

IPS Academy, Institute of Engineering and Science, Indore, India



Green Jobs for Climate Resilience: Ghana's LIPW Experience

Prosper Basommi Laari

Ghana Productive Safety Net Project, MLGCRA, Ghana
Department of Environment and Resource Studies
University of Business and Integrated Development Studies
Ghana

Climate change is an environmental, employment, and social protection issue for vulnerable and climate-exposed households and communities reliant on climate-sensitive natural resources for their livelihood. This paper presents Ghana's Labour-Intensive Public Works (LIPW) component under the Ghana Productive Safety Net Project 2 as an example of how temporary public works programs can generate green jobs and build resilience. The paper develops a Climate-Responsive Public Works Nexus linking social protection, productive employment, and climate change through green jobs and climate-resilient natural capital, community assets, and ecosystems. The article relies on findings from the current state of implementation of GPSNP 2 and a literature review on public works programs, green jobs, just transition, climate-responsive social protection, and climate-smart landscapes and infrastructure. As of September 2026, 83,411 people have benefitted from LIPW, with 69.5% female beneficiaries, generating 7,993,427 person-days of employment. The portfolio of interventions under the Public Works programme includes 497 Climate Change Mitigation Intervention, mostly rehabilitation of degraded lands, 129 small earth dams, 857Km of feeder-roads, and 14 natural parks. The plantations established span over 4,600hectares, surpassing the project target of 2,500 hectares. More than 7 million fruit tree seedlings have also been produced under the Public Works programme and planted on over 40,000 Hectares of land by interested farmers with priority given to the poor and extreme poor households. The paper argues that the climate value of public works does not reside merely in constructing green assets but in realizing multiple development outcomes through four transformation pathways: wage, asset, skills/knowledge, and collective action. The paper proposes decent climate-appropriate working conditions, appropriate technology, institutional arrangements, operation and maintenance (O&M), climate financing, and transition from temporary employment to productive, climate-smart jobs with appropriate skills.

Presenter:

Prosper Basommi Laari

Ghana Productive Safety Net Project, MLGCRA, Ghana
University of Business and Integrated Development Studies, Ghana



Environmental Commitment in Moroccan SMEs: Exploring Managerial Drivers

Hanan FALI

Faculty of Economics and Management of Guelmim
Ibn Zohr University, Morocco

The depletion of water resources, global warming, soil erosion, atmospheric pollution and other environmental degradation that the world has experienced in the recent decades has made it necessary to emerge and spread the notion of sustainable development. Thus, by constraint or by opportunity, company managers are today increasingly led to integrate sustainable development practices into their strategies, through the concept of corporate social responsibility, to ensure the sustainability of their companies, ultimately reduce the industrial and ecological risks linked to their activities and thus strengthen their competitiveness. In this manner, the manager within the SME has a key role in the company management system. Therefore, the environmental commitment of SMEs could be interpreted in terms of the personal characteristics of the manager. This paper's goal is to shed light on the influence of manager's profile on the environmental commitment of small and medium-sized Moroccan companies. To achieve this, we have theoretically delimited our research by proposing an inventory of the main concepts and theories used. We also used a qualitative research method to answer our main question. It was carried out in the form of semi-structured interviews with 24 SME managers. Our findings show that environmental commitment of the SMEs is greatly influenced by the values of the manager, especially those of self-transcendence and openness to change. Moreover, the managers who have received environmental training are more inclined to engage in environmental practices. After all, our research results highlight the usefulness of targeted strategies and training in the environmental field from the State for the benefit of these managers.

Presenter:

Hanan FALI

Ibn Zohr University, Morocco



Leveraging Historical Collision Alert Data: Kinematic and Spatial Analysis for Location-Based Classification

**Arthur Franca¹, Hugo Alexandre¹, Oswaldo Nico²,
Giovani Pavoski², Vinícius Cavalcante², Gabriel Alencar
Silva Almeida Dantas² and Giorgio de Tomi²**

¹Hexagon Mining, Brazil

²Department of Mining and Petroleum Engineering
University of São Paulo, Brazil

Open-pit mining operations are highly complex environments where continuous interactions between heavy vehicles necessitate the implementation of advanced safety measures and precise identification of inherent risks. The sectorization of operational areas plays a critical role in contextualizing potential hazards by delineating functional and transit zones. In this context, the precise classification of where an interaction occurs is fundamental to correctly assessing its risk potential. This study explores an innovative machine learning approach for the automatic sectorization of mines, utilizing telematics data from a Collision Avoidance System (CAS).

The research focuses on predicting vehicle locations within distinct operational classifications—such as loading, dumping, and hauling areas—by processing kinematic and spatial data. The collision avoidance system, in addition to providing real-time alerts, generates a valuable historical dataset, including equipment position at short time intervals, as well as detailed information on the speed and trajectory of the opposing vehicle during each interaction. Applying machine learning techniques to this historical data enriches the knowledge base, providing a more robust and accurate platform for classifying interactions and subsequently evaluating their risk potential.

The adopted methodology was based on supervised machine learning methods, trained on a dataset previously classified using polygons that delimit cataloged areas within the mine environment. The data pre-processing steps were crucial and incorporated the creation of new features, such as time-lag and temporal derivatives of speed and position, to enhance the model's predictive capability. The approach's validation was conducted across two separate mining environments, and the results highlight the importance of adapting machine learning models to the unique characteristics of each mine design. This study establishes a solid foundation for the development of advanced, data-driven applications aimed at

significantly enhancing safety in mining operations, enabling more proactive and effective risk management.

Presenter:

Arthur Rocha França

Hexagon Mining, Brazil



GIS-Based Assessment of the Potential for Photovoltaic Panels and Green Roofs in Iași, Romania

Otilia Pitulac, Constantin Chirilă, Florian Statescu and Nicolae Marcoie

Gheorghe Asachi Technical University of Iasi, România

Urban areas are increasingly facing multiple pressures driven by climate change, population growth, and rising energy consumption, which calls for integrated solutions for the energy transition and climate adaptation. The aim of this study is to estimate and map the spatial potential for implementing photovoltaic (PV) panels and green roofs in the city of Iași (Romania), and to identify priority areas for interventions with synergistic benefits. The scope focuses on built/urban surfaces assessed at the intra-urban level, with emphasis on roof characteristics and local variation in the solar resource. The methodology relies on moderate-to-high-resolution geospatial datasets, including the ALOS AW3D30 DSM and Copernicus Urban Atlas 2018, processed in ArcMap 10.8.1 and ArcGIS Pro 2.6.0. Solar radiation was modeled using the Area Solar Radiation tool for the mean year 2023, and roof typology (flat/pitched) was derived through slope analysis. The results indicate pronounced spatial heterogeneity in suitability for PV and green roofs. The Copou neighborhood stands out with the highest share of roofs suitable for PV (73.6%) and, at the same time, the highest potential for green roofs (46.6%), suggesting a major opportunity for integrated implementation. The study concludes that the combined use of PV and green roofs can generate cumulative benefits (energy efficiency, urban heat island mitigation, stormwater management, and biodiversity support), providing an operational basis for prioritizing investments and for urban planning decisions oriented toward green infrastructure and renewable energy.

Presenter:

Otilia Pitulac

Gheorghe Asachi Technical University of Iasi, România



Nitrogen Use Efficiency: A Nature Based Technique to Mitigate Nitrate Pollution under Changing Climate

Jothimani. S¹ and **K. Sivasabari²**

¹Professor & Head, Cotton Research Station

Tamil Nadu Agricultural University, India

²Amrita Vishwa Vidyapeetham, Coimbatore, India

Nitrate is the most widespread pollutant in groundwater (Bhatnagar and Sil-lanpää, 2011) and the dramatic increase by anthropogenic sources such as nitrogen-rich fertilizers, discharge of poorly treated domestic, and industrial wastewaters, livestock manure, and leachate from landfill sites (Tokazhanov et al., 2020) besides drought. A significant environmental health crisis was noticed in 440 Indian districts with excessive nitrates (>50 mg/L) as of 2023 causing severe risks, including blue baby syndrome in infants and potential cancer links (Abascal et al., 2022). Nitrogen use efficiency (NUE) is an Agriculture technique to reduce nitrate pollution in soil. In India, an average N use efficiency was 22% suggested wasting more N fertilizers (Jothimani, 2021). To reduce the hazardous effects of nitrate nitrogen and to produce higher yield and to identify genotypes which absorb more N and efficiently utilize to give higher and profitable yield under changing climate condition 32 short duration rice varieties were delineated and classified into highly responsive (10), moderately responsive (5), low responsive (7) and non-responsive cultures (10) based on the responsiveness and utilization of applied nitrogen by the variety. Further, various nitrogen use efficiency parameters like agro-nomic efficiency, physiological efficiency, apparent recovery efficiency, and utilization efficiency were calculated from the field experiment, and the AE vs PE model was used to classify and delineated rice genotypes by using EC 725224 as standard N-efficient rice genotypes. The technique of selection of highly efficient and responsive rice variety/cultures under low nitrogen input can be used as a tool under crop improvement programme to evolve better crop variety. The genetic variation existed in NUE was due to rhizospheric effects of extent and pattern of root architecture. The NUE was further improved by modified nitrogen fertilizer products such as neem-coated urea, gypsum-coated urea, and sand-incubated urea in different levels under high N-efficient and responsive genotypes.

Presenter:

Jothimani Subbiah

Cotton Research Station, Tamil Nadu Agricultural University, India



Beyond Formal Law: Harnessing African Indigenous Knowledge to Foster Green Marketing Governance and Sharing Economy

Chipo Mutongi and Theo Tsokota

Midlands State University, Zimbabwe

There is a wide range of knowledge and wisdom in the indigenous systems. As the world grapples with the challenges of environmental degradation and climate change, indigenous wisdom offers a wealth of indigenous knowledge that can inform sustainable green marketing practices. This presentation explores the potential of indigenous knowledge and wisdom to drive innovation and transformation in green marketing, highlighting the importance of decolonizing the mind and dominant Western perspectives and embracing diverse worldviews that are sustainable. The whole marketing mix may be implemented through the use of indigenous knowledge. Indigenous preservation can be implemented in bio-degradation items. There are indigenous proverbs, riddles, songs and ceremonies that preach and teach the power of maintaining the eco-system. Indigenous foods also carry all the health and medical aspects for longevity. Through a critical review of existing literature and case studies, we examine how indigenous knowledge can inform sustainable consumption patterns, eco-friendly product development and culturally sensitive marketing communications. We argue that by unlocking the power of indigenous wisdom, marketers can develop more effective and sustainable green marketing strategies that not only reduce environmental damage but also promote cultural diversity and social justice. Ultimately, this presentation aims to inspire a new generation of marketers to embrace indigenous knowledge and wisdom to create a more sustainable and equitable green marketing future. This chapter therefore responds to increased calls to go beyond formal environmental laws and harness the potential power of African indigenous knowledge to foster green marketing governance.

Presenter:

Chipo Mutongi

Midlands State University, Zimbabwe



A Multicriteria Framework for Evaluating Walkability and Non-Motorized Transport Infrastructure for Climate-Smart Urban Mobility in Pune City

Arjun Singh Lodhi

Assistant Professor, Department of Civil Engineering (Planning)
COEP Technological University, India

Rapid urbanisation, increasing motorisation and climate-related challenges have intensified the need for sustainable and climate-responsive urban mobility systems. Walking and other forms of non-motorized transport (NMT) play a critical role in reducing transport-related emissions, improving accessibility and supporting healthier and more resilient cities. However, inadequate pedestrian infrastructure, discontinuous footpaths, unsafe crossings, encroachments and conflicts with motorised traffic continue to constrain NMT use in Indian cities. This study proposes a multicriteria framework for evaluating walkability and NMT infrastructure in Pune City with the objective of supporting climate-smart and sustainable urban mobility planning.

The study integrates primary field surveys, pedestrian and NMT volume counts, pedestrian infrastructure audits, user perception surveys and GIS-based spatial analysis. Key parameters including accessibility, connectivity, safety, comfort, continuity, infrastructure quality and environmental conditions are assessed through a structured evaluation framework. A combination of Analytical Hierarchy Process (AHP)/Fuzzy AHP and Importance–Performance Analysis (IPA) is proposed to determine the relative importance of walkability parameters and identify critical infrastructure deficiencies. GIS-based analysis is subsequently used to spatially represent walkability conditions and identify priority locations for intervention.

The expected outcome is a Walkability and NMT Assessment Index capable of classifying urban areas according to their pedestrian and NMT performance and identifying locations requiring immediate improvement. The framework will support evidence-based prioritisation of footpaths, crossings, NMT facilities, universal accessibility measures and pedestrian safety interventions. The study contributes to climate-smart city planning by demonstrating how improvements in non-motorized mobility can simultaneously support low-carbon transportation, inclusive accessibility, public health and climate-resilient urban development.

Presenter:

Arjun Singh Lodhi

COEP Technological University, India



Climate Change and Indigenous Knowledge through Nature-Based Solutions: Adaptation, Mitigation, and Livelihood Resilience Challenges of Indigenous Communities in the Chittagong Hill Tracts of Bangladesh

Uyi Shing Marma

Researcher & Founder President, Chittagong Hill Tracts Research Society (CHTRS), Bangladesh

The **Chittagong Hill Tracts (CHT)** of **Bangladesh** is one of the most climate- vulnerable regions in the country, where Indigenous communities increasingly face environmental stresses such as erratic rainfall, prolonged drought, landslides, forest degradation, and declining agricultural productivity. These climate-related challenges significantly threaten traditional livelihoods, food security, and the socio-cultural sustainability of Indigenous peoples. In this context, Indigenous knowledge systems embedded in local ecological practices provide valuable nature-based solutions that contribute to climate change adaptation, mitigation, and livelihood resilience.

The main objective of this study is to examine the role of Indigenous knowledge in developing community-based nature-based solutions for addressing climate change impacts in the CHT. The research adopts a mixed-methods approach, combining household surveys, key informant interviews, focus group discussions, and field observations. The study documents traditional agricultural practices, forest conservation strategies, water resource management techniques, and community-based governance systems practiced by Indigenous communities.

The findings reveal that Indigenous ecological knowledge significantly enhances ecosystem services, improves natural resource management, and strengthens community resilience against climate-related risks. Practices such as traditional watershed protection, diversified cropping systems, and community-led forest stewardship contribute to sustainable environmental management and climate adaptation.

The study concludes that Indigenous knowledge-based nature-based solutions are cost- effective, culturally grounded, and environmentally sustainable strategies for climate action. Integrating these practices into national climate policies and development frameworks can strengthen inclusive and locally adaptive climate resilience in the CHT.

Presenter:

Uyi Shing Marma

Chittagong Hill Tracts Research Society (CHTRS), Bangladesh



Physicochemical and Photoluminescence Properties of Piperine Thin Films Prepared by Spin Coating

**Faridah Abdul Razak^{1,2}, Nor Hanifawati Inai¹,
Masnindah Malahubban², Zakry Fitri Ab Aziz² and
Anissa Azlan¹**

¹Faculty of Humanities, Management and Science
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²Department of Physics, Faculty of Science, Low Dimensional
Materials Research Centre, University of Malaya, Malaysia

Piperine, a naturally occurring organic compound, has attracted increasing interest for optoelectronic applications due to its favorable optical characteristics. In this work, the physicochemical and photoluminescence properties of piperine thin films prepared by the spin-coating technique were systematically investigated. The primary objective of this study is to evaluate the suitability of spin-coated piperine thin films for potential optoelectronic device applications through comprehensive structural, morphological, optical, and photophysical analyses. Piperine thin films were deposited from solution onto suitable substrates using a controlled spin-coating process to ensure film uniformity and reproducibility. Structural and physicochemical characterization was carried out using appropriate techniques to assess film quality, phase behavior, and surface morphology. The results demonstrate that the spin-coating method produces smooth, homogeneous, and well-adhered piperine thin films with good physicochemical stability. Optical absorption measurements revealed that the piperine thin films possess a wide optical band gap exceeding 3 eV, indicating their potential as wide-band-gap organic semiconductors. Photoluminescence studies showed strong blue emission under ultraviolet excitation at 330 nm, confirming the efficient radiative recombination processes within the films. In addition, the interaction and potential combination of piperine with another organic semiconductor material were briefly examined, suggesting that piperine can be effectively integrated into hybrid organic systems to tailor optical and photophysical properties. Overall, the findings of this study highlight that spin-coated piperine thin films exhibit promising physicochemical and photoluminescence characteristics, making them suitable candidates for future applications in organic optoelectronic devices such as light-emitting diodes and photonic components.

Presenter:

Faridah Abdul Razak

Universiti Putra Malaysia Sarawak, Malaysia

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