Abstract Book

SIP 2025

Sustainable Innovations and Partnerships

20-21 March
BC, Canada

March 20-21, 2025
University of British Columbia
Vancouver, Canada

Hasan Dincer
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March 2025

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March 20-21, 2025

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Message

From the Conference Organizing Chair

Prof. Hasan Dincer

Executive Operations Chair (EOC)
Research and Education Promotion Association (REPA)
1401 21st, Sacramento, CA 95811, USA

Professor
School of Business, Istanbul Medipol University
Kavacık South Campus, Beykoz, 34810, Istanbul, Turkey

It is with great enthusiasm that I welcome you to the 2025 International Conference on Sustainable Innovations & Partnerships (SIP2025) at the University of British Columbia (UBC), Vancouver, Canada. As the world faces unprecedented environmental and socio-economic challenges, SIP2025 serves as a critical forum for fostering innovation, collaboration, and sustainable solutions that align with the United Nations Sustainable Development Goals (SDGs).

This year, we are proud to present 39 accepted abstracts across six key themes, reflecting the diverse and impactful research being conducted globally. The conference brings together leading researchers, policymakers, and industry experts to explore advancements in Environmental Sustainability, Renewable Energy, Engineering Innovations, Business & Economic Development, Agriculture & Food Security, and Social Policy & Human Development. Each theme represents a crucial aspect of global sustainability efforts, and we are excited to showcase cutting-edge ideas and transformative solutions.

At SIP2025, we emphasize the power of interdisciplinary collaboration to drive meaningful change. The conference features plenary speakers, expert panel discussions, and research presentations aimed at translating knowledge into real-world applications. By fostering dialogue between academics, industry leaders, and policymakers, SIP2025 creates opportunities for groundbreaking partnerships that extend beyond the conference itself.

SIP2025 officially recognized by the Canada Border Services Agency (CBSA), further reinforcing its status as an internationally significant event. We appreciate the support of our technical and publication sponsors, including the Research and Education Promotion Association (REPA), Discover Sustainability (Springer, IF: 2.4), Sustainability (MDPI, IF: 3.3), and others.

As a passionate advocate for sustainability-driven research, I am inspired by the work being presented at this conference. Your participation is essential in shaping a future that is not only resilient but also

inclusive and forward-thinking. I encourage you to engage in meaningful discussions, explore new collaborations, and take bold steps toward sustainable innovation.

Thank you for being part of SIP2025. I look forward to the ideas and partnerships that will emerge from this gathering and contribute to a more sustainable world.

Prof. Hasan Dincer
March 2025

Vision & Goals

2025 International Conference on Sustainable Innovations and Partnerships (SIP2025)

How SIP2025 Supports the UN SDGs …

2025 International Conference on Sustainable Innovations and Partnerships (SIP2025) aims to drive sustainable innovation, interdisciplinary collaboration, and impactful solutions to global challenges. Through cutting-edge research and knowledge exchange, we foster partnerships that advance environmental, economic, and social sustainability while promoting real-world applications of technological and policy-driven innovations.

2025 International Conference on Sustainable Innovations and Partnerships (SIP2025) aligns with the United Nations Sustainable Development Goals (SDGs) by addressing critical global issues, including climate action, clean energy, sustainable cities, responsible consumption, and social equity. By uniting academics, policymakers, and industry leaders, the conference translates research into actionable strategies that contribute to a more resilient, inclusive, and sustainable future.

Key thematic areas include:

- ✓ Environmental Sustainability and Climate Resilience – Addressing climate change, resource conservation, and green infrastructure.
- ✓ Renewable Energy and Clean Technologies – Innovations in solar, wind, hydrogen, and energy efficiency.
- ✓ Engineering and Technological Advancements – Smart infrastructure, AI-driven solutions, and sustainable materials.
- ✓ Business and Economic Sustainability – ESG strategies, circular economy, and financial resilience in sustainability.
- ✓ Agriculture and Food Security – Sustainable farming, waste reduction, and climate-adaptive practices.
- ✓ Social Sciences and Policy Innovations – Equitable development, governance, and community engagement in sustainability.

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2025 International Conference on Sustainable Innovations and Partnerships (SIP2025)

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Hasan Dincer
Organizing Chair
Professor, School of Business, Istanbul Medipol University, Kavacık South Campus, Beykoz, 34810, Istanbul, Turkey
Executive Operations Chair (EOC), Research and Education Promotion Association (REPA), 1401 21st Street, Sacramento, CA 95811, USA

Celia Shahnaz
Publication and Award Chair
Professor, Department of Electrical and Electronic Engineering
Bangladesh University of Engineering and Technology (BUET)
ECE Building, West Palashi Campus, Dhaka 1205, Bangladesh

Hyanen Jestelle
Communication and Relationship Chair
Conference Series Manager, Research and Education Promotion Association (REPA), 1401 21st Street, Sacramento, CA 95811, USA

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Conference Publication

Publication Opportunities

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Following the successful 2025 International Conference on Sustainable Innovations & Partnerships (SIP2025) held at the University of British Columbia, Vancouver, Canada, we are pleased to announce the publication opportunities for accepted and presented papers.

All submissions underwent a rigorous double-blind peer review process conducted by a distinguished Editorial Board, ensuring the highest academic standards in originality, impact, and relevance.

After the conference, accepted papers were carefully assigned for publication based on scientific quality, thematic relevance, and editorial recommendations.

1. **Springer – Discover Sustainability** (*ISSN 2662-9984, Impact Factor: 2.4*)

Selected high-quality papers have been recommended for publication in Discover Sustainability by Springer, an esteemed international journal. Authors whose papers met the journal's additional peer-review criteria have been invited to submit their manuscripts for final evaluation.

- Please note: Publication in Discover Sustainability requires an Article Processing Charge (APC), which is not covered by the conference registration fee.
- Authors who opted out of the Springer journal or were not selected were directed to alternative high-impact publication outlets.

2. REPA Journals – Multidisciplinary Open-Access Publications

A significant number of conference papers have been published in REPA's partner journals, contributing to research in sustainability, engineering, business, and environmental sciences. These include:

- Journal of Sustainability Outreach *(ISSN 2435-7243)*
- Journal of Sustainable Energy Revolution *(ISSN 2435-7251)*
- Journal of Environmental Science Revolution *(ISSN 2435-726X)*
- Journal of Engineering and Technology Revolution *(ISSN 2435-7278)*
- Journal of Business and Management Revolution *(ISSN 2435-7286)*
- Journal of Ecoscience and Plant Revolution *(ISSN 2435-7294)*

3. REPA Proceeding Series (ISSN 2435-7308)

All accepted abstracts and select full papers have been published in the REPA Proceeding Series, ensuring open-access visibility and indexing in major academic databases.

ISSN 2662-9984
Journal Impact Facto: 2.4 (2023)
CiteScore 6.8, JCR - Q2 (Environmental Sciences)
Editor-in-Chief: Prof. Walter Leal Filho, Hamburg University of Applied Science, Berliner Tor 5, 20099 Hamburg, Germany

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16 Days: Submission to first decision (median)

2.3 (2023): 5-year Journal Impact Factor

838,823 (2023): Downloads

sustainability
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48 Days: Median article processing time

20 Days: Submission to first decision

3.4 Days: Acceptance to publication

Theme 1

Environmental Sustainability and Climate Resilience

Editorial Note

The research presented in this theme examines critical environmental challenges, from climate-induced disasters and pollution to deforestation and sustainable development. These studies collectively highlight the pressing need for innovative strategies that balance ecological preservation with economic and social stability. Studies on disaster resilience underscore the role of urban planning in mitigating climate change impacts. Research assessing urban flood resilience in Colombo, Sri Lanka, based on ten physical and social parameters, demonstrates how well-integrated green spaces and efficient drainage systems significantly reduce flood risks, whereas impervious urban zones remain highly vulnerable. Findings suggest that sustainable land use planning and green infrastructure are crucial in enhancing adaptability to extreme weather events.

Environmental contamination poses another severe threat, as demonstrated by research on polycyclic aromatic hydrocarbons (PAHs) in British Columbia's marine habitats. The study identified hotspots of industrial pollution affecting Chinook salmon and resident killer whales, with PAH levels showing a significant correlation with sediment depth and organic carbon content. These findings reinforce the urgent need for stringent environmental policies and proactive ecosystem conservation strategies.

The link between climate change and migration is also a key concern. Research focusing on the feminization of climate migration in Kerala, India, highlights how women, as primary caregivers, bear disproportionate burdens in post-disaster recovery. Economic instability and displacement force many into unsustainable livelihood practices, further exacerbating environmental degradation. The study advocates for gender-responsive climate policies and increased access to sustainable economic resources. Deforestation studies reveal that economic activities such as agriculture often conflict with conservation efforts. Research on Rwanda's tea industry illustrates how a networked stakeholder approach can mitigate deforestation while maintaining economic growth. Engaging government agencies, NGOs, and industry players in structured governance can lead to sustainable agricultural models that balance resource conservation with productivity.

Future research should focus on scalable adaptation models, cross-sector collaboration, and technology-driven environmental monitoring. Strengthening local governance and participatory decision-making will be essential in developing resilient policies that align with both ecological and economic goals. These studies provide a robust foundation for evidence-based strategies to ensure long-term environmental sustainability and climate resilience.

Impact of Climate-Induced Disasters on the Sustainability of Cities: An Urban Resilience Perspective to Floods

Mutu Tantrige Osada Vishvajith Peiris
The University of Hong Kong, Pok Fu Lam, Hong Kong

Abstract: Climate change has intensified extreme rainfall and flood events, posing significant threats to urban sustainability. Floods, among the most catastrophic disasters, disrupt livelihoods and irreversibly damage economies, making disaster risk reduction critical for achieving safe, inclusive, and sustainable cities in line with the Sustainable Development Goals. Urban resilience, reflecting a city's ability to respond, recover, and maintain core functions during disasters, is challenging to assess due to complex urban system interactions and the non-linear nature of climate emergencies. This study examines resilience through land use changes as indicators of urban sustainability against flood disasters, using Colombo City, Sri Lanka, as a case study.

The research evaluates urban flood resilience (UFR) based on ten natural, physical, and social parameters, integrating urban growth simulation, flood modeling, and geospatial assessments at a 30-meter resolution. Land use categories; waterbodies, wetlands, vegetation, and urban built-up areas; were analyzed alongside resilience classifications ranging from flood-susceptible to highly responsive. Results reveal that high-resilience areas are concentrated in vegetated high elevations and urban zones with effective drainage systems, while low-resilience areas are heavily populated floodplains and impervious city-center areas with limited greenery. Regression analysis confirms that impervious surfaces exacerbate flood risk, while vegetation and wetlands provide long-term resistance to extreme rainfall.

The findings emphasize the need for green infrastructure-oriented drainage networks and sustainable urbanization to mitigate pluvial floods. Incorporating land use changes and socio-economic factors highlights the importance of disaster preparedness at the grassroots level for effective mitigation strategies. From an urban planning perspective, this approach aids in guiding future land use changes, prioritizing sustainable growth, and informing decision-makers on resource allocation to enhance flood resilience in cities.

Keywords: *Urban resilience, Floods, Climate change, Land use change, Sustainable cities, Colombo*

Spatial Distribution and Source Apportionment of Polycyclic Aromatic Hydrocarbons (PAHs) in Chinook Salmon and Resident Killer Whale Marine Habitat in British Columbia, Canada

Joseph J. Kim

Ocean Wise Conservation Association, Vancouver, Canada

Abstract: The at-risk populations of resident killer whales (Orcinus orca) in the northeastern Pacific and their primary prey, Chinook Salmon (Oncorhynchus tshawytscha), are exposed to a range of contaminants, including polycyclic aromatic hydrocarbons (PAHs). These persistent, bioaccumulative, and toxic compounds pose significant threats to the recovery of these marine species. This study analyzed 76 PAHs in subtidal surface sediments (1–435 m depth) collected from 98 sites along the British Columbia coast to identify spatial hotspots, characterize distribution patterns, and assess habitat quality using 12 priority PAHs.

Principal component analysis (PCA) revealed site-specific PAH profiles. Parent PAHs were dominant in Burrard Inlet, Pender Harbour, and Namu Harbour, while lighter alkylated PAHs prevailed in Tsawwassen and Port Renfrew. Forensic ratio analyses confirmed the PAHs originated from both pyrogenic and petrogenic sources. PCA further demonstrated that octanol-water partition coefficient (log KOW) and total organic carbon (TOC) significantly influenced PAH distributions ($p < 0.001$), with depth gradients leading to heavier PAHs accumulating in shallow sediments and lighter PAHs dominating deeper sediments ($p < 0.001$).

Hotspots of PAH concentrations were identified in Southern Vancouver Island, the central and north coast, the Strait of Georgia, and Haida Gwaii. Marine habitat quality assessments based on Canadian Sediment Quality Guidelines (SQGs) indicated potential toxicity-related impacts on lower trophic level prey species, affecting Chinook Salmon across seven conservation units. Elevated concentrations of priority PAHs in critical habitats of Southern Resident Killer Whales (SRKWs) suggest indirect threats to these populations due to impacts on benthic organisms.

These findings emphasize the urgent need for targeted management actions to mitigate PAH-related risks and support conservation efforts for Chinook Salmon and resident killer whales.

Keywords: *Critical marine habitat, Chinook Salmon, Resident Killer Whales, Polycyclic Aromatic Hydrocarbons (PAHs), Sediment Quality Guidelines (SQGs)*

Climate Change and Sustainable Development: A Community Approach in India

Jagbir Singh
University of Delhi, Delhi, India

Abstract: India, covering 3.28 million square kilometers or 2.4% of the world's land surface, is the second most populous country globally. Climate change presents a significant environmental challenge, particularly in regions where livelihoods depend on natural resources. In such areas, climate adaptation measures play a crucial role in safeguarding rural livelihoods and promoting sustainable development. India faces numerous climate-related challenges, including adverse effects on agriculture, water resources, forests, biodiversity, public health, and coastal management, alongside rising temperatures. Among these, the decline in agricultural productivity is a primary concern, as a significant portion of the population depends on agriculture directly or indirectly.

Climate change imposes additional stress on ecological and socioeconomic systems already under pressure from rapid industrialization, urbanization, and economic growth. Addressing these challenges requires a community-centered approach that integrates sustainable development strategies with climate adaptation initiatives. Empowering local communities to adopt climate-resilient practices is essential to mitigating climate change impacts and ensuring long-term sustainability.

This study examines the intersection of climate change and sustainable development in India, emphasizing the role of community-based approaches in addressing environmental and socioeconomic challenges.

Keywords: *Climate change, Community-based adaptation, Sustainable development, Agricultural productivity, Biodiversity conservation*

Feminization of Climate Migration and Its Implications for Environmental Sustainability: A Study of Kerala Floods

Hardika Sumedh Bhagat

Tata Institute of Social Sciences, Maharashtra, India

Abstract: This study examines the repeated flooding issues in Kerala, India, through a feminist lens, focusing on gendered migration and its implications for environmental sustainability. Kerala's geographical vulnerabilities exacerbate the impact of floods, with women bearing the brunt of the challenges. The research analyzes how women's roles in migration and post-disaster recovery disrupt sustainable practices and aggravate environmental degradation in the region.

Using a comprehensive approach, the study combines spatial analysis of migration patterns with qualitative interviews involving women migrants, community leaders, and environmental activists from flood-affected districts. Findings reveal that women, often primary caregivers and economic providers, face heightened vulnerabilities, including insecure housing, labor exploitation, and limited access to rehabilitation programs. Loss of traditional livelihoods in agriculture and fisheries has led to the breakdown of Kerala's resource-efficient ecosystem, forcing women to adopt unsustainable coping mechanisms, such as overextraction of natural resources or reliance on external aid.

The research underscores the urgent need for an intersectional approach to climate resilience in Kerala, integrating gender equity and environmental sustainability as core principles. It highlights the feminization of climate migration as a socio-economic challenge and a critical threat to environmental sustainability. The study advocates for gender-sensitive disaster management and climate adaptation policies that empower women as key stakeholders. Recommendations include improving women's access to sustainable livelihoods, incorporating gendered impacts into environmental planning, and promoting community-driven restoration initiatives.

This study emphasizes the importance of addressing the intersection of gender and environmental sustainability in climate resilience efforts, urging Kerala to prioritize inclusive and sustainable strategies for long-term recovery and adaptation.

Keywords: *Feminization, Climate migration, Floods, Gender equity, Environmental sustainability*

An Analysis of the Use of Network Management Approach to Reverse Deforestation and Enhance Economic Growth in Rwanda's Tea Industry

Clarisse Uwayezu
Catholic Institute of Kabgayi, Muhanga, Rwanda

Abstract: This study examines the impact of deforestation on Rwanda's economy, particularly within the tea processing sector, and evaluates the potential of a network management approach as a solution to mitigate deforestation while aligning with Sustainable Development Goals (SDGs) 13 (Climate Action) and 15 (Life on Land). The research aims to explore how collaborative networks can effectively minimize deforestation and ensure economic viability for stakeholders in Rwanda's tea industry.

A mixed-methods approach was employed, incorporating stakeholder analysis, feasibility studies, and the development of organizational and communication structures tailored to Rwanda's unique context. Data were collected from a purposive sample of 50 stakeholders, including representatives from government agencies, NGOs, tea processing companies, and local communities. Using semi-structured interviews, focus group discussions, and surveys, the study captured qualitative and quantitative insights into stakeholder interests, socio-economic impacts of deforestation, and barriers to sustainable practices.

The findings reveal that addressing deforestation requires more than technical solutions, as the interplay of stakeholder interests necessitates a structured network management framework. This approach involves engaging high-power, interested stakeholders while adequately informing and monitoring those with lower power and interest. A well-coordinated network enhances sustainable practices, such as adopting biogas for tea processing to support SDG 13, while a steering committee fosters consensus and biodiversity preservation, aligning with SDG 15.

By prioritizing network management and inclusive stakeholder engagement, Rwanda's tea industry can balance economic growth with environmental sustainability. The study underscores the importance of strategic communication and cooperative frameworks in reversing deforestation, offering practical pathways for advancing Rwanda's commitment to sustainable development.

Keywords: *Network management, Deforestation, Tea industry, Rwanda, Sustainable Development Goals, Stakeholder engagement*

Theme 2

Engineering and Technological Innovations

Editorial Note

The research presented in this theme demonstrates the role of engineering and technological advancements in addressing sustainability challenges across architecture, materials science, and urban planning. These studies highlight innovative approaches to energy efficiency, resource optimization, and sustainable construction, reinforcing the importance of integrating technology with ecological and cultural considerations.

Building retrofitting emerges as a key strategy for enhancing energy efficiency. Research on daylight optimization in heritage buildings underscores the significance of high-performance glazing, prismatic redirection films, and electrochromic windows in improving occupant comfort and energy efficiency. Simulations using Radiance, EnergyPlus, and DAYSIM validate these solutions, ensuring their applicability in preserving cultural landmarks while meeting modern sustainability standards. Material innovation is another focal point. Studies on upcycling rice husk ash into ceramic gemstones illustrate the potential of agricultural waste repurposing through controlled calcination and annealing processes. Findings show that surface reflectance exceeding 90% and hardness above 500 HV make these materials suitable for decorative and functional applications, promoting circular economy principles.

Urban sustainability is also explored through microclimate modeling for vertical farming and agrivoltaic integration. Research conducted in Singapore demonstrates how replacing conventional building materials with vegetation mitigates urban heat island effects. Simulation-based assessments highlight that integrating agrivoltaic systems on rooftops enhances food security while improving solar panel efficiency. Traditional architecture and its relevance to sustainable design are examined through thermal performance studies of wattle and daub residences in Sri Lanka. Findings indicate that wall thickness variations impact thermal mass and energy efficiency, underscoring the importance of adapting vernacular building techniques to contemporary climate challenges.

Sustainability reporting in engineering is another critical area. A study of North American construction firms reveals significant gaps in materiality disclosure, particularly in ecological impact and product lifecycle reporting. Improved transparency and governance frameworks are necessary to align industry practices with sustainability goals. Future research should focus on scalable engineering solutions, adaptive reuse of materials, and AI-driven environmental modeling. By leveraging interdisciplinary collaboration, these studies contribute to a data-driven, resilient, and ecologically mindful future for engineering and construction industries.

Natural Daylight Optimization in Retrofitting Buildings

Ambareen Fatima, Emma Saville, Hana Harada, Liyan Shahin, Vaanya Paracha, and Shaheen Aliyar

University of Toronto, Toronto, Canada

Abstract: Optimizing natural daylight in buildings is a cornerstone of sustainable design, with significant implications for occupant well-being, energy efficiency, and heritage preservation. This research investigates strategies for enhancing daylight access in existing campus buildings through retrofitting, focusing on heritage structures where cultural preservation is essential. By addressing key architectural design elements—such as window placement, sizing, and material selection—alongside advanced technologies like high-performance glazing, electrochromic windows, and prismatic glazing, the study aims to redirect daylight deeper into interior spaces while maintaining energy efficiency.

A hybrid methodology underpins this research, combining simulation-based tools like Radiance, EnergyPlus, and DAYSIM with co-simulation approaches validated by the International Building Performance Simulation Association (IBPSA). These tools enable accurate modeling of daylight and thermal performance, while redesign efforts in window placement, façade design, and reflective material use are supported by Grasshopper software. To validate theoretical findings, physical prototypes are constructed for iterative testing, ensuring practical applicability.

The research applies these principles to the University of Toronto's heritage buildings, including Hart House, Knox College, and Convocation Hall. Strategies include enhancing window systems, incorporating reflective surfaces, using daylight-redirecting films, and integrating advanced glazing technologies such as solar-control glass and low-emissivity coatings.

This study contributes to sustainable campus development by offering a replicable model for daylight optimization in heritage buildings. It supports regulatory compliance with daylighting standards (LEED, WELL, and BREEAM), enhances occupant health and well-being through biophilic design principles, and advances the intersection of sustainability and cultural preservation. By integrating modern daylight solutions with historical architecture, this research empowers architects, engineers, and policymakers to make informed decisions for retrofitting culturally significant structures.

Keywords: *Daylight optimization, Building retrofitting, Heritage preservation, Energy efficiency, Sustainable design*

Upcycling Rice Husk Ash into High-Quality Ceramic Gemstones: A Sustainable Approach for Environmental and Economic Innovation

Siriwan Chokkha, Panpailin Jaichuey, Chatcha Chooma, and Saowalak Boonphakdee
Suranaree University of Technology, Nakhon Ratchasima, Thailand

Abstract: This study focuses on synthesizing ceramic gemstones from rice husk ash, a form of agricultural waste, to develop sustainable materials addressing environmental challenges. The process involves controlled calcination of rice husks at 300°C, 500°C, and 700°C, resulting in ash with varying colors: black at 300°C, gray at 500°C, and white at 700°C. The transformation of silica from an amorphous phase at lower temperatures to a cristobalite phase at 700°C impacts the material's heat reactivity and viscosity, influencing the melting properties of the ceramic gems.

The gemstone synthesis combines calcined rice husk ash with specific chemical additives, followed by melting at 1250°C. The molten mixture is quenched in air to shape the gemstones and subsequently annealed at 550°C for structural stabilization. The calcination temperature significantly affects the gemstone color, with 300°C producing garnet-like red hues and higher temperatures yielding brighter colors. The gemstones exhibit surface reflectance exceeding 90% and hardness levels above 500 HV, making them suitable for decorative and functional applications.

This approach demonstrates the potential of rice husk ash as a resource for creating high-quality ceramic gemstones. It promotes sustainable waste management, supports local innovation, and offers economic opportunities for community-based production. By upcycling agricultural waste, this method contributes to achieving environmental and economic sustainability.

Keywords: *Agricultural waste upcycling, Rice husk ash, Sustainable materials, Ceramic gemstones, Waste management*

Urban Microclimate Modeling for Side-Facade Farming and Agrivoltaic Deployment in Town Estates

Mille Ling Wei Goh[1], Marcus Rui Jie Teo[1], Wei Jun Lim[1], Barbara Ting Wei Ang[1], Chew Beng Soh[1], Matteo Clementi[2], and Valentina Dessi[2]

[1] Singapore Institute of Technology, Singapore, Singapore
[2] Polytechnic University of Milan, Milan, Italy

Abstract: Singapore, a densely urbanized island city with limited agricultural space, faces pressing challenges from climate change and the urban heat island effect (UHIE). This study examines the feasibility and potential benefits of integrating vertical farming (VF) on building façades and agrivoltaic (AV) systems on the rooftops of public housing (HDB) estates as sustainable solutions. To evaluate local microclimatic conditions, solar irradiance mapping was conducted using ClimateStudio across three HDB estates, representing both old and new buildings, to identify suitable façade surfaces for VF systems. The irradiance data were further analyzed using an energy balance equation to assess surface temperatures, while additional parameters such as Daily Light Integral (DLI) and Photosynthetically Active Radiation (PAR) were incorporated to determine façade suitability for crop cultivation.

The simulation results indicate that VF systems on HDB façades provide a substantial cooling effect by reducing heat transfer into buildings through the replacement of conventional materials with vegetation. This effect contributes to lower internal temperatures and enhances urban thermal comfort. Suitable crops were identified based on façade conditions: (i) green pepper, suitable for high-light environments; (ii) cabbage, ideal for mid-rise façades; and (iii) lettuce, which thrives in shaded areas.

Additionally, the study examined the design and feasibility of modular AV systems on HDB rooftops using Grasshopper and PVSyst simulation software. Various AV configurations were evaluated to optimize agricultural productivity and solar energy generation. Findings suggest that incorporating crops within AV systems not only supports food production but also enhances photovoltaic efficiency by mitigating panel temperatures.

The combined implementation of VF and AV systems presents a promising strategy for reducing carbon emissions associated with vegetable transportation, contributing to urban sustainability goals. This research demonstrates the feasibility and benefits of deploying VF and AV systems on HDB buildings, supporting Singapore's objectives for food security, renewable energy, and climate resilience.

Keywords: *Urban microclimate modeling, Urban sustainability, Food security, Renewable energy, Building thermal management*

The Impact of Material Thickness on the Thermal Performance of Wattle and Daub Residences in Sri Lankan Vernacular Architecture

Oshanie Kumudika Rammuthupura, and Himalshi Tharanga Rupasinghe
General Sir John Kotelawala Defence University, Dehiwala-Mount Lavinia, Sri Lanka

Abstract: Wattle and daub (*Katu Mati Gewal*) residences have long been a hallmark of rural Sri Lankan vernacular architecture, particularly in regions such as the Ampara District. These traditional homes often feature walls of varying thickness, influenced by local construction practices, material availability, and climatic considerations. Typical wall thicknesses in the Ampara District range from 20 cm to 40 cm, presenting an opportunity to examine how such variations impact thermal performance.

Thicker walls generally offer enhanced thermal mass, better heat absorption, and improved dissipation properties, but the optimal wall thickness for thermal comfort and energy efficiency in Sri Lanka's tropical climate remains unclear. This study addresses this gap by analyzing the thermal performance of wattle and daub residences with different wall thicknesses, focusing on indoor temperature regulation and energy efficiency. Using EnergyPlus, a thermal simulation software, the study models various wall thicknesses and assesses their thermal mass and capacity for regulating indoor temperatures under real-world conditions with regional climate data. Key metrics such as time lag and thermal damping are evaluated to determine the influence of wall thickness on indoor climate stability.

The findings identify the most suitable wall thickness for the region's climatic conditions, highlighting the thermal comfort and energy efficiency benefits inherent in traditional wattle and daub construction. This research underscores the relevance of vernacular architecture as a sustainable solution for contemporary design, offering valuable insights for addressing the environmental challenges faced in tropical climates while promoting the preservation of cultural heritage.

Keywords: *Vernacular architecture, Wattle and daub, Thermal performance, Wall thickness, Tropical climates, Energy efficiency*

Evaluating Materiality Disclosure in Sustainability Reports: A Study of North American Construction and Engineering Firms

Jason Pang, Andrea Sanchez, Jonathan Landsman, Emilia Dunkerley, Harleen Kaur, and Joanna Xu

University of Toronto, Toronto, Canada

Abstract: This study examines the sustainability reporting practices of 10 leading North American construction and engineering firms, focusing on their alignment with the Sustainability Accounting Standards Board (SASB) Standards for the Engineering and Construction Services sector. Disclosures across five material topics; Ecological Impacts, Product Quality & Safety, Employee Health & Safety, Product Design & Lifecycle Management, and Business Ethics are assessed using a systematic scoring framework. The findings reveal significant gaps and inconsistencies in reporting quality, with most firms failing to achieve full compliance with SASB metrics.

Ecological Impact disclosures are limited, with inconsistent reporting on environmental risk management and incidents of non-compliance. Product Quality & Safety reporting is notably weak, with significant underreporting on key metrics. Moderate levels of disclosure are observed in Employee Health & Safety, where a few firms report metrics like Total Recordable Incident Rates (TRIR) for both direct and contracted employees. In Product Design & Lifecycle Management, leaders such as Stantec and EMCOR provide detailed disclosures on certified projects, but many firms fail to include comprehensive data on project backlogs, particularly for hydrocarbon-related and energy projects. Business Ethics emerges as the weakest area, with no firm meeting SASB standards for disclosures on bribery, corruption, or anti-competitive practices.

The study highlights the urgent need for greater transparency and standardization in sustainability reporting across the construction and engineering industry. By adopting robust environmental management systems, leveraging digital tools for data accuracy, and implementing transparent governance frameworks, firms can improve their alignment with SASB-identified material topics. Enhancing sustainability reporting practices not only facilitates regulatory compliance but also strengthens stakeholder trust, promotes accountability, and supports long-term environmental and social sustainability in the sector.

Keywords: *Sustainability reporting, SASB standards, Construction and engineering, Material topics, Sustainability disclosure*

Theme 3

Sustainable Business and Economic Development

Editorial Note

The research presented in this theme explores the complex relationship between financial performance, sustainability, and technological innovation in business and economic development. These studies highlight how firms navigate market fluctuations, sustainability mandates, and financial constraints while fostering long-term resilience.

Luxury manufacturing emerges as a case study in resilience, with research analyzing 16 years of financial performance in French luxury leather manufacturers. Findings reveal that conglomerate-owned firms face higher volatility due to interest rate fluctuations and ecological factors such as drought conditions and fluctuations in meat production. This challenges conventional assumptions that large-scale luxury firms inherently benefit from greater stability. The sustainability of small businesses in developing economies is also a key focus. Research on SMEs in Nepal and other developing countries underscores the importance of financial access, regulatory support, and infrastructure investment in ensuring long-term growth. Findings indicate that SMEs contribute significantly to employment and economic expansion but require more robust policy frameworks to thrive.

Financial technology plays a crucial role in advancing economic inclusion and sustainability. A bibliometric study on Fintech's role in Sustainable Development Goals (SDGs) highlights how innovations like blockchain, mobile banking, and peer-to-peer lending enhance financial connectivity. However, persistent challenges such as cybersecurity risks and regulatory compliance gaps remain barriers to widespread adoption, particularly in underserved regions. Operational efficiency in key infrastructure sectors is another area of interest. Research on port productivity at the Port of Ngqura in South Africa identifies technology integration, staff training, and infrastructure improvements as critical factors in enhancing economic performance. Findings suggest that NAVIS and SPARCS systems significantly optimize port logistics and overall efficiency.

The balance between ESG initiatives and profitability is a growing concern in corporate strategy. Case studies on sustainable engineering firms demonstrate how organizations can simultaneously reduce greenhouse gas emissions, transition to renewable energy, and maintain profitability. The integration of equity, diversity, and inclusion (EDI) policies further enhances corporate resilience by fostering innovation and employee engagement. Future research should explore scalable models for sustainable business growth, digital financial inclusion strategies, and enhanced ESG reporting frameworks. By bridging policy gaps and leveraging technological advancements, businesses can drive economic development while maintaining environmental and social responsibility.

Behind the Glamour: Factors of Financial Performance of French Luxury Leather Manufacturers

Elizaveta Golovanova

University of Marie et Louis Pasteur, Besançon, France

Abstract: French luxury brands are renowned for their resilience amid ecological and macroeconomic challenges, but their suppliers often face significant disruptions. This study examines the financial performance of 31 French luxury leather manufacturers over a 16-year period (2006–2021), focusing on return on assets (ROA) and return on sales (ROS). The comprehensive overview of French leather market, including statistics on implementation of corporate sustainability practices is provided. Using panel linear regression models with fixed effects, the analysis incorporates macroeconomic, market, and ecological variables, alongside a binary variable distinguishing four Hermès manufacturers as part of a big luxury conglomerate.

The results demonstrate the overall resilience of the luxury leather sector. The findings reveal that Hermès manufacturers, operating within a big luxury conglomerate, are more influenced by interest rate fluctuations, that reflects their dependence on borrowing costs. Additionally, Hermès manufacturers show lower profitability and greater vulnerability to external factors such as drought conditions, fluctuations in meat production and in meat prices compared to other luxury firms in the sample. These results challenge the perception that large-scale luxury corporations inherently enhance resilience and efficiency within the luxury manufacturing sector.

This study contributes to understanding the complex interplay between economic, market, and ecological factors in the financial performance of luxury leather manufacturers, offering insights for stakeholders aiming to strengthen resilience and profitability in this sector.

Keywords: *Luxury leather manufacturing, Financial performance, Resilience, Macroeconomic factors, Ecological challenges*

Sustainability of Small Businesses in Developing Countries

Min Tamang, and Mohamed Alfaz
CECOS College London, London, United Kingdom

Abstract: This study explores the potential for achieving a sustainable future for small-scale businesses in developing countries. Small and medium-sized enterprises (SMEs) serve as the backbone of national economies in these regions, contributing significantly to employment generation, income production, and poverty alleviation. In Nepal, SMEs play a crucial role in economic development; however, they face several challenges, including limited access to financing, inadequate infrastructure, and regulatory barriers that hinder their growth and sustainability.

The research adopts a quantitative approach, utilizing secondary data collected from various online sources such as websites, journals, and articles. The study involves data collection, evaluation, and analysis to provide insights into the key factors influencing the sustainability of small businesses in developing economies. Findings highlight the critical role of SMEs in job creation and economic development, emphasizing the need for supportive policies and investment in infrastructure to foster their long-term growth.

By identifying the challenges and opportunities faced by SMEs, this research provides valuable recommendations for policymakers and stakeholders to enhance the sustainability of small businesses in developing countries. Strengthening financial support mechanisms, improving regulatory frameworks, and investing in infrastructure are essential to ensuring the resilience and growth of these enterprises.

Keywords: *Small businesses, Sustainability, Developing countries, Regulatory challenges, Economic development*

Mapping the Intersection of Financial Technology and Sustainable Development Goals: A Bibliometric Approach

Bablu Kumar Dhar
Mahidol University International College, Salaya, Thailand

Abstract: The advancement of financial technology (Fintech) is transforming the global financial landscape by enhancing connectivity, efficiency, and social inclusion within financial services. This study explores the relationship between Fintech and the Sustainable Development Goals (SDGs) through a bibliometric analysis, identifying trends, challenges, and future research opportunities. Analyzing 72 documents published between 2019 and 2024, the findings indicate that the adoption of blockchain technology, peer-to-peer lending, electronic payment systems, and mobile banking plays a crucial role in improving financial inclusion and fostering economic growth.

The study highlights Fintech's potential to contribute to multiple SDGs, notably SDG 1 (poverty reduction), SDG 8 (economic growth), and SDG 10 (reducing inequalities). However, significant challenges persist, including the digital divide, regulatory compliance, cybersecurity threats, and consumer protection issues, which are particularly pronounced in economically disadvantaged and remote areas. Addressing these challenges requires interdisciplinary Fintech solutions that support long-term sustainability and equitable financial access.

This research provides valuable insights for academics and policymakers, facilitating the development of inclusive and sustainable financial strategies. By mapping the existing research landscape, the study offers a foundation for future exploration and actionable policy interventions to maximize Fintech's contribution to global development objectives.

Keywords: *Financial technology, Sustainable development goals, Fintech, Economic inclusion, Bibliometric analysis*

Enhancing Performance: Factors Contributing to Operations at the Port of Ngqura, Gqeberha

Laura Novienyo Abla Amoah, and Aluta Mlonzi
Nelson Mandela University, Gqeberha, South Africa

Abstract: This study examines the factors influencing productivity at the Port of Ngqura, a key driver of economic growth in South Africa. A qualitative research approach was employed, involving interviews with employees from Transnet Port Terminals and Transnet National Port Authority. Of the ten employees identified, four participated in the study, providing insights into the elements affecting operational efficiency.

The findings highlight key productivity factors, including skilled staff, efficient training programs, advanced equipment, technology, and robust infrastructure. Respondents emphasized the critical role of technology, particularly planning and operations systems such as NAVIS and SPARCS, in optimizing port performance. Infrastructure was also identified as a major determinant of productivity, with respondents underscoring the need for continuous improvement in this area.

Based on these findings, the study provides recommendations to enhance productivity at the Port of Ngqura. These include investment in employee training, upgrading infrastructure, and leveraging advanced technologies to optimize operations. Implementing these measures is expected to improve the port's efficiency and contribute significantly to South Africa's economic growth.

Keywords: *Port productivity, Port of Ngqura, Operations efficiency, Infrastructure, Technology, Economic growth*

Balancing Green and Gold: Advancing ESG While Driving Profitability

Anahita Jami
CIMA+, Toronto, Canada

Abstract: This study presents the intricate balance between advancing Environmental, Social, and Governance (ESG) initiatives and maintaining profitability, drawing lessons from the practices of CIMA+. As sustainability becomes a core priority for organizations, the challenge lies in achieving meaningful environmental and social impact while sustaining financial performance.

CIMA+ has demonstrated its commitment to combating climate change through ambitious decarbonization efforts, aiming for net-zero emissions by 2040. Intermediate goals, such as a 50% reduction in greenhouse gas (GHG) emissions by 2027, underline their proactive approach. Strategies like transitioning to electric vehicles and adopting renewable energy solutions not only mitigate environmental impacts but also position the organization as an industry leader in sustainable innovation.

The integration of sustainability within engineering projects is another hallmark of CIMA+'s approach. From designing energy-efficient buildings to implementing public transit systems and repurposing infrastructure, the organization showcases how sustainable practices can simultaneously address client demands and create long-term value. These projects exemplify the feasibility of aligning environmental objectives with operational goals.

Social responsibility and inclusion are key components of CIMA+'s ESG strategy. Through equity, diversity, and inclusion (EDI) initiatives, the organization fosters a culture of collaboration and innovation. Targeted recruitment efforts and partnerships with equity-deserving groups highlight how inclusivity drives organizational performance. Furthermore, employee well-being programs enhance workforce engagement and motivation, directly contributing to success.

Governance and risk management are pivotal to CIMA+'s ESG framework. Enhanced transparency and ethical practices, such as ESG-focused training and proactive risk assessments, reinforce stakeholder trust and ensure the organization's long-term competitiveness. By embedding these principles into operations, CIMA+ safeguards its reputation while maintaining profitability.

Keywords: *ESG, Sustainable engineering, Social impact, Responsible business, Profitability*

Theme 4

Renewable Energy and Sustainable Technologies

Editorial Note

The research presented in this theme explores advancements in clean energy technologies, innovative applications of artificial intelligence (AI) in energy systems, and financial models driving renewable energy adoption. These studies demonstrate how emerging solutions are reshaping the energy landscape, enhancing efficiency, and promoting sustainability.

The integration of up-conversion nanoparticle (UCNP) films in photovoltaic panels exemplifies how nanotechnology can optimize solar energy efficiency. Findings reveal that embedding UCNPs in a fluoropolymer matrix enhances power output by up to 9.74%, converting infrared radiation into usable light. This advancement significantly improves PV panel efficiency, accelerating the transition to more effective solar technologies. Another transformative approach is the dynamic simulation of solar-driven hydrogen production for sustainable transportation. Modeling under Toronto's climatic conditions demonstrates how integrating 100 kW photovoltaic arrays with electrolyzers can provide clean hydrogen fuel, reducing greenhouse gas emissions. The study underscores the importance of advanced simulation tools in optimizing renewable energy integration into mobility solutions.

Innovative financing models are also crucial to expanding solar adoption. Research on solar photovoltaics in Africa highlights the effectiveness of pay-as-you-go (PAYG) systems, solar leasing, and crowdfunding models in overcoming financial barriers. By mitigating upfront costs, these models enhance accessibility, particularly in underserved regions, facilitating widespread renewable energy adoption. Artificial intelligence and machine learning applications are further transforming energy systems. By integrating neural networks for predictive energy modeling, AI-driven frameworks optimize energy distribution and efficiency. This research highlights AI's potential in minimizing energy losses and enhancing sustainability through real-time monitoring and decision-making tools.

Renewable energy's broader socio-economic impact is also explored. Studies on biorefineries and biofuels emphasize their role in mitigating climate change, reducing ecological damage, and enhancing energy security. Additionally, sustainable energy strategies post-COVID-19 highlight the need for localized renewable solutions to enhance resilience and reduce reliance on global supply chains.

Future research should focus on scaling nanotechnology applications in photovoltaics, expanding AI-driven energy management systems, and refining financial models for renewable energy adoption. By fostering cross-disciplinary collaboration, these innovations will drive the global transition to cleaner and more sustainable energy systems.

Integrating Up-Conversion Nanoparticle Films to Maximize Photovoltaic Power Output

Li Zhong Pang, Wei Jun Lim, Barbara Ting Wei Ang, Hui An, Szu-Cheng Chien, and Chew Beng Soh

Singapore Institute of Technology, Singapore, Singapore

Abstract: Silicon-based photovoltaic (PV) panels are pivotal in advancing sustainable energy solutions, yet their efficiency is limited by the mismatch between solar irradiance and the absorption spectrum of silicon. This discrepancy leads to energy losses and thermal buildup from infrared radiation, further reducing power output. This study explores the development of a light conversion film incorporating up-conversion nanoparticles (UCNPs) to address these challenges. Specifically, $NaYF_4^{3+}/Er^{3+}$ UCNPs were chosen for their photoluminescence properties, enabling the conversion of near-infrared (NIR) light into visible light, thus utilizing otherwise wasted energy.

UCNPs were embedded in a fluoropolymer matrix (FEVE) and applied to transparent 3M films, which were subsequently tested on silicon-based PV panels under real-world solar conditions. Among the tested configurations, films with a 10% concentration of blue and green-emitting UCNPs demonstrated the most consistent power generation. The 10% green-emitting UCNP film exhibited the highest performance during peak sunlight, achieving power gains of 3.52% and 3.48%, respectively, compared to unmodified panels. When isolated from the inefficiencies of the 3M film, the performance of the UCNP-coated films showed even greater improvements, with power increases of 9.74% and 9.69%.

The integration of UCNP-coated films into silicon PV panels represents a promising strategy for enhancing solar energy conversion efficiency by harnessing NIR radiation. This innovative approach provides a practical solution for improving PV panel performance, supporting the global transition to efficient and sustainable energy systems.

Keywords: *Clean energy, Sustainable technology, Photovoltaic system, Nanoparticle thin film, Solar energy efficiency*

Dynamic Simulation of Solar-Driven Green Hydrogen Production for Sustainable Transportation in Canada

Hassan Mushtaq
University of Sialkot, Punjab, Pakistan

Abstract: The transition to sustainable transportation necessitates innovative solutions that utilize renewable energy technologies. This study focuses on the design and dynamic simulation of a solar-assisted green hydrogen production system, aimed at providing a clean and efficient alternative to fossil fuels for transportation. Using TRNSYS software, the system integrates a 100 kW photovoltaic (PV) solar array with an electrolyzer to produce hydrogen, demonstrating a potential pathway toward sustainable mobility.

Simulations are conducted under Toronto's climatic conditions, capturing the effects of seasonal variations and real-time solar irradiance on system performance. Key performance indicators, including hydrogen yield, energy efficiency, and system reliability, are analyzed to evaluate the feasibility and scalability of the system. The results indicate that solar-driven hydrogen production can significantly reduce greenhouse gas emissions while contributing to energy independence, highlighting its potential as a sustainable energy solution.

This research illustrates the importance of combining advanced simulation tools with renewable energy technologies to address the challenges of decarbonizing the transportation sector. The findings provide valuable insights into the operational efficiency and environmental benefits of solar-assisted hydrogen production systems, contributing to the development of scalable and sustainable transportation solutions. By leveraging renewable energy resources, this work supports global efforts to achieve decarbonization and fosters the advancement of clean energy technologies.

Keywords: *Scalability, Hydrogen production, Dynamic simulation, Renewable energy, Sustainable transportation*

Emerging Innovative Models for Commercial and Industrial Solar Photovoltaics in Africa

James Mwangi
Independent Researcher, Nairobi, Kenya

Abstract: Innovative financing models for commercial and industrial solar photovoltaics (PV) in Africa are unlocking significant opportunities for sustainable development. However, high upfront costs have historically limited solar PV adoption across many viable markets. To address these challenges, pioneering financing mechanisms tailored to Africa's unique socio-economic landscape have emerged, reducing barriers for new private investments and enabling adoption among commercial and industrial players.

This study categorizes key solar financing innovations in Africa, including solar leasing, pay-as-you-go (PAYG) models, on-bill financing, and solar crowdfunding platforms. Real-world case analyses reveal that these approaches effectively mitigate risks and upfront costs, driving broader adoption. For instance, Kenya's Solar Connection program leverages mobile money and smart metering technologies to enable flexible solar payments, increasing access for small businesses. These innovations are evaluated based on their capital attraction potential, risk-sharing mechanisms, and policy alignment.

While these financing models demonstrate immense promise, uneven policy frameworks across African nations and low customer awareness about emerging options limit their scalability. Addressing these challenges requires targeted policy support and strategic initiatives to boost awareness and education about financing options. Such efforts could drive sustainable growth in the solar PV sector, catalyzing private capital flows and fostering renewable energy development across underserved African markets.

In conclusion, with appropriate policy readiness and stakeholder engagement, innovative solar financing models have the potential to transform the commercial and industrial solar landscape in Africa, contributing to energy sustainability and economic growth.

Keywords: *Solar photovoltaics, Financing innovation, PAYG solar, Renewable energy in Africa, Solar leasing, Sustainable energy*

Redefining Energy Systems with AI and Machine Learning Applications

Mir Sayed Shah Danish
Research and Education Promotion Association (REPA), Sacramento, United State of America

Abstract: The integration of artificial intelligence (AI) and machine learning (ML) into energy systems offers transformative opportunities for optimizing energy production and distribution. Building upon prior frameworks for modeling and optimizing solar energy systems, this study explores advanced AI-driven methodologies to enhance energy system performance, sustainability, and adaptability. Central to this approach is the utilization of neural networks (NNs) to model and predict complex energy patterns, leveraging tailored algorithms that account for environmental dynamics and operational constraints.

This work introduces a comprehensive AI-ML framework designed to improve energy generation efficiency across diverse systems, including solar and wind. The proposed framework integrates robust optimization algorithms, such as the quasi-Newton method, with data-driven techniques for accurate forecasting. By employing a detailed process of data curation, normalization, and analysis, the framework ensures reliability and scalability across varied datasets and applications. Key innovations include an online simulation tool for real-time monitoring and optimization, enabling stakeholders to make informed decisions and respond dynamically to changing conditions.

The study underscores the potential of AI-ML models to minimize energy losses, enhance operational efficiency, and support sustainable energy goals. It also highlights the critical role of interdisciplinary applications in addressing global energy challenges. The findings contribute to bridging the gap between theoretical advancements and practical implementations, setting a benchmark for intelligent energy systems. This work advances the vision of sustainable, efficient, and adaptive energy systems that align with environmental and societal demands.

Keywords: *AI in energy systems, machine learning optimization, neural networks, sustainable energy, intelligent energy modeling*

Renewable and Sustainable Clean Energy Development and Its Impact on Social, Economic, and Environmental Health

Oludotun Olugbemi
World Hope Foundation, Abeokuta, Nigeria

Abstract: The global transition to clean, renewable, and sustainable energy is essential for improving social, economic, and environmental health, driving productivity and economic development. This study explores the role of renewable energy in mitigating climate change and enhancing environmental health while evaluating the viability of renewable energy sources as an alternative to fossil fuels. The shift toward renewables is identified as a critical strategy for reducing climate change impacts and fostering sustainable development.

Advanced technologies, such as biorefineries and bioreactors for lignocellulosic biomass transformation, represent promising innovations for biofuel production. These technologies provide opportunities for high-value fuel and product generation while reducing reliance on fossil fuels. However, maximizing the potential of these technologies requires government support through policies that encourage technological innovation in academia and industry. This collaboration is critical to advancing clean energy solutions and achieving long-term sustainability.

The study highlights the benefits of renewable energy sources, including energy security, improved access to energy, social and economic progress, and climate change mitigation. By reducing ecological and health impacts, renewable energy not only addresses environmental challenges but also contributes to global efforts toward achieving a sustainable future.

Keywords: *Renewable energy, Climate change mitigation, Biofuels, Biorefinery, Sustainable energy, Environmental health, Economic progress*

Cutting-Edge Innovations and Strategies in Sustainable Energy Systems: Paving the Way for a Greener Future

Ateeq Ur Rehman

Independent Researcher, Gujrat, Pakistan

Abstract: The global disruptions caused by the COVID-19 pandemic have exposed the vulnerabilities of urban areas, particularly their reliance on global supply chains for essential resources like energy, food, and water. These disruptions have highlighted the urgent need for localized solutions to ensure the resilience of critical supplies. Additionally, the pandemic has underscored the significant health risks posed by both outdoor and indoor pollution, which exacerbated the spread and severity of the virus. In response, many countries are shifting towards policies that prioritize sustainable energy solutions, with a focus on electrification powered by renewable energy sources, as advocated by the International Energy Agency.

This study explores the integration of innovative strategies in sustainable energy systems to address these challenges and support long-term recovery. Key areas of focus include energy policy, biomass energy, energy-efficient buildings, and sustainable power systems. The research highlights the necessity of adopting renewable energy technologies, aligned policy frameworks, and effective management practices to build resilience against future disruptions.

By capturing insights from recent advancements, the study contributes to the global conversation on transitioning to renewable energy systems. It emphasizes the importance of sustainable energy as a cornerstone of recovery strategies, promoting resilience, reducing pollution, and paving the way for a greener and more sustainable future.

Keywords: *Sustainable energy, Renewable systems, Energy policy, Resilience, Biomass energy, Energy-efficient buildings*

Theme 5

Agriculture, Food Security and Rural Development

Editorial Note

The research presented in this theme highlights innovative strategies for sustainable agriculture, food security, and rural development. These studies emphasize the role of community engagement, technological advancements, and resource optimization in enhancing agricultural sustainability while addressing socio-economic challenges.

Urban agriculture is gaining traction as a viable solution to food security, particularly in densely populated cities. Research on modular urban farming in Singapore explores the integration of vertical farming and rooftop agriculture into residential areas. Findings reveal that while community support for urban farming is high, active participation remains limited, necessitating policies that incentivize local engagement in sustainable food production. The implementation of modular farms demonstrated significant annual yield improvements, reaching 130.2 kg/m², showcasing the potential of such initiatives to enhance urban food resilience. Revitalizing traditional industries through agricultural waste utilization is another key focus. Studies on rural industries in Taiwan illustrate how agricultural byproducts, such as lemongrass waste and charcoal distillation residues, can be repurposed into incense-making and DIY courses. These initiatives not only promote economic diversification but also strengthen community heritage and engagement in sustainable design practices.

Improving processing efficiency in agribusiness is essential for sustainability. Research on snow pea processing plants in Peru applies Sustainable Lean methodologies and Life Cycle Assessment (LCA) to identify inefficiencies and reduce resource waste. Findings indicate that better resource utilization and targeted training programs significantly improve operational efficiency, ensuring economic viability while reducing environmental impact.

The integration of sustainable industrial practices into traditional farming communities is also explored. A study on citrus farmers in Peru's Palmas Ipoki region utilizes the SAFA (FAO) assessment and Lean Manufacturing principles to enhance productivity and farmer livelihoods. The model proposed in the study demonstrates a 5% improvement in quality-of-life indicators, underscoring the importance of value chain optimization in rural economic resilience. Future research should focus on scaling up urban farming models, expanding circular economy initiatives in rural industries, and leveraging digital tools for precision agriculture. By fostering sustainable agricultural systems and engaging local communities, these studies contribute to a more resilient and food-secure future.

Feasibility and Community Acceptance of Modular Urban Farming in Singapore: Design, Prototyping, and Pilot Testing

Barbara Ting Wei Ang[1], Yin Mei Fong[1], David Tan[2], Hui An[1], Szu-Cheng Chien[1], Chew Beng Soh[1], Matteo Clementi[3], and Valentina Dessi[3]

[1]Singapore Institute of Technology, Singapore, Singapore
[2]Netatech Pte Ltd, Singapore, Singapore
[3]Polytechnic University of Milan, Milan, Italy

Abstract: Food security is a pressing global challenge, exacerbated by urbanization and industrialization that reduce agricultural land availability. In Singapore, a city-state with limited land area and a reliance on food imports, achieving nutritional self-sufficiency for its 5.9 million residents is an increasing concern. Sustainable solutions like urban farming, rooftop agriculture, and vertical farming offer potential relief, but their success depends heavily on community acceptance and participation.

This study investigates local attitudes toward modular urban farming in residential areas through a survey of Singaporean residents. While respondents expressed general support for urban farming initiatives, there was limited engagement in farm operations and maintenance. These findings highlight the need for strategies to encourage community involvement in sustainable food production.

Based on survey insights, a modular urban farming unit was designed to integrate agriculture into underutilized urban spaces. The design process employed tools such as Revit BIM for architectural modeling, IESVE for computational fluid dynamics (CFD) simulations to optimize airflow, and BIM HVAC for evaluating shading materials, ensuring suitable crop growth conditions. The modular farm, inspired by traditional terraced rice paddies, features a stilted structure to adapt to uneven rooftop terrains typical of Housing Development Board (HDB) buildings.

A prototype was constructed on a campus in Dover, Singapore, where local crops such as Kailan and Bok Choy were cultivated between March and August 2023, achieving an average yield of 25.6 kg/m² annually. A second prototype iteration at Oasis Living Lab demonstrated further optimization, with an average yield of 130.2 kg/m² per year from September 2023 to February 2024. These results confirm the feasibility, adaptability, and productivity of modular urban farming for high-density urban environments, offering a sustainable solution to food security concerns.

Keywords: *Urban farming, Sustainable agriculture, Community health, Modular farming, Food security*

Design Research on Revitalizing Rural Traditional Industries: A Case Study of Agricultural Waste Utilization

Wang Yi-Qing, Lee Yann-Long, Ke Xin-Yu, and Chen Yu-Chi
Chaoyang University of Technology, Taichung, Taiwan

Abstract: Lemongrass and charcoal were once key industries driving Taiwan's rural economy, but their prominence waned with industrialization. Recently, the resurgence of tourist factories has sparked interest in preserving traditional techniques, exemplified by the Maoxiang Charcoal Factory. This factory upholds artisanal practices such as manual charcoal burning and essential oil distillation. Despite its rich heritage, the distillation process generates significant agricultural waste, which is often undervalued. However, the clean, high-quality wood used in distillation—derived from materials like cypress and camphor—offers substantial potential for innovative reuse.

This research employs field investigations, interviews, and design methodologies to explore the repurposing of agricultural waste. By drawing parallels with domestic and international incense-making practices, the study integrates local traditions with sustainable design strategies. Collaborative site communications and planning led to the creation of a handcrafted initiative that highlights the cultural and economic value of these byproducts.

The initiative culminated in a DIY course that educates visitors on the heritage and operations of the Maoxiang Charcoal Factory. Participants engage with high-quality wood derived from the distillation process, crafting incense products while gaining an appreciation for sustainable practices and traditional craftsmanship. This course received widespread acclaim from both community members and tourists, underscoring its potential to enhance local engagement and economic revitalization.

This case study demonstrates how design-driven approaches can transform agricultural byproducts into value-added products, fostering sustainability and preserving cultural heritage. The findings provide actionable insights for similar industries, showcasing how traditional craftsmanship and innovative utilization of agricultural waste can coexist to support rural development.

Keywords: *Agricultural inputs, DIY handicraft courses, Community features, Traditional craftsmanship, Sustainable design*

Advancing Snow Peas Processing Plants Through Sustainable Lean and Life Cycle Assessment

Jackeline Alva

Pontifical Catholic University of Peru, San Miguel, Peru

Abstract: Agribusiness remains a cornerstone of Peru's economy, employing over 27% of the national workforce, with a significant concentration in rural areas. Among the key crops, snow peas (*Holantao*) hold a prominent position in international markets, particularly in Europe and Asia, due to their nutritional properties. Despite their importance, the production and processing of snow peas face significant challenges, including high production costs, inefficient resource utilization, compliance with international standards, and high personnel turnover, all of which threaten the sustainability and profitability of the crop.

This study applies Sustainable Lean methodologies, including Sustainable Value Stream Mapping (SVSM), and Life Cycle Assessment (LCA) to evaluate and enhance the sustainability of a snow pea processing plant in Humay, Pisco, Ica, Peru, which processes approximately 7 tons per day. The research analyzes the environmental impacts across the production chain, from raw material reception to processing and distribution, identifying critical inefficiencies in resource usage, emissions, and operational workflows. Recommendations are proposed to improve efficiency, reduce waste, and enhance the overall profitability of the plant, with a direct positive impact on workers and operational sustainability.

Preliminary findings highlight the need for comprehensive training on resource utilization and production processes, resulting in improved operational efficiency, worker satisfaction, and safety. These measures not only enhance sustainability but also strengthen market positioning by aligning with global certifications and standards. The integration of LCA and Lean tools into the snow pea production chain demonstrates significant economic benefits while establishing Peru as a sustainable supplier of high-quality agricultural products, bolstering competitiveness in international markets.

Keywords: *Sustainable agriculture, Life cycle assessment, LCA, lean, Sustainable value stream mapping*

Transforming the Orange Value Chain in Palmas Ipoki: A Sustainable Plan Using SAFA (FAO) Assessment and Lean Manufacturing Tools

Fiorella Ruth Cancho Valencia

Pontifical Catholic University of Peru, San Miguel, Peru

Abstract: Agribusiness is one of Peru's most rapidly expanding sectors, with oranges emerging as a high-potential crop. Globally, Peru ranks twentieth in orange production, and the demand for citrus fruits, including oranges, has surged post-COVID-19 due to their antioxidant properties and high vitamin C content. Despite increased production and demand, small and medium-sized orange farmers face challenges such as low profit margins, oversupply, rising competition, and escalating production costs. These factors have led to a decline in agricultural engagement, with many farmers migrating to urban areas in search of better opportunities. Addressing these issues is critical to improving farmers' livelihoods while sustaining agricultural activities.

This study focuses on the citrus farmers of Palmas Ipoki, proposing a sustainable plan to enhance their living conditions through the industrialization of orange production. The plan adopts a value chain perspective, integrating the SAFA (Sustainability Assessment of Food and Agriculture Systems) framework from the FAO and Lean Manufacturing tools to improve efficiency. By optimizing processes, the approach aims to reduce production costs, minimize waste, enhance product quality, and expand access to competitive markets.

The proposed framework is designed to deliver tangible benefits, including a 5% improvement in quality-of-life indicators, increased net income, and strengthened socioeconomic resilience among farmers. By enabling more sustainable practices and efficient value chain management, this initiative contributes to the economic stability of Palmas Ipoki's citrus farmers and supports the long-term sustainability of the orange value chain.

Keywords: *Sustainable industrialization, Livelihoods, SAFA assessment, Lean Manufacturing, Small-scale farmers*

Revitalizing Rural Communities: Sustainable DIY Courses Leveraging Agricultural Byproducts

Ko Hsin-Yu, Lee Yann-Long, Zeng Cai-Ying, and Liu Pei-Wei
Chaoyang University of Technology, Taichung, Taiwan

Abstract: This study examines the potential of integrating agricultural byproducts into community-based DIY courses, focusing on the Liyu Community in Sanyi, Miaoli, Taiwan. Renowned for its chemical-free farming practices and recognition under the International Satoyama Initiative in 2021, the Liyu Community has experienced increased demand for experiential courses following the pandemic. This research aims to revitalize the community by designing workshops that utilize local resources and promote sustainability.

Field investigations and participatory design approaches identified the community's potential to repurpose agricultural waste, particularly rice straw, into culturally meaningful crafts. The workshops were designed around creating SHIMENAWA (sacred straw ropes) combined with leather stamping, blending traditional craftsmanship with contemporary creativity. These workshops were structured as half- or full-day programs, integrating hands-on activities with cultural and ecological education. The goal was to highlight the community's unique identity while fostering environmental stewardship.

Initial outcomes indicate that these workshops successfully increased local engagement and attracted visitors, receiving positive feedback for their creative and educational value. Participants reported heightened awareness of agricultural waste reuse and the cultural significance of SHIMENAWA. However, challenges related to material preparation and logistics emerged, underscoring the need for process refinements in future implementations.

This research emphasizes the role of design in sustainable community development and cultural preservation. By transforming agricultural byproducts into value-added products and educational experiences, the project not only addresses waste management but also strengthens community cohesion and economic resilience. These findings contribute to broader discussions on leveraging local resources for sustainable and inclusive development in rural areas.

Keywords: *Agricultural waste, Rice straw, SHIMENAWA, DIY course design, Community development*

Theme 6

Society, Policy and Human Development

Editorial Note

The research presented in this theme explores diverse societal challenges, from sustainability in infrastructure and policy frameworks to socio-economic resilience and behavioral insights. These studies highlight the intersection of governance, social equity, and community engagement in addressing contemporary global issues. Institutional capacity plays a crucial role in advancing sustainable hydropower projects. Research on stakeholder engagement in Malaysia's hydropower sector emphasizes the need for inclusive policy frameworks and enhanced third-party collaboration to ensure social and environmental sustainability. Findings indicate that robust institutional mechanisms can foster more effective partnerships, addressing regulatory and social concerns in large-scale energy projects. The role of design thinking and innovation in problem-solving is another critical area of focus. A study introducing the "Insightful Design" methodology demonstrates how a structured, iterative design process enhances product development and creativity. The framework, validated through competition-winning designs, provides actionable strategies for integrating user needs with innovative solutions.

Workforce well-being remains a vital aspect of economic development. Research on emotional intelligence (EI) in the Nigerian construction industry reveals a strong correlation between EI and job satisfaction, highlighting the importance of professional development programs that cultivate EI skills. These findings underscore the need for EI training to enhance workplace satisfaction and productivity. Consumer behavior is also examined through Gen Z's engagement with sustainability and fast fashion. Despite their commitment to environmental values, price, social media influence, and accessibility drive their purchasing choices, leading to cognitive dissonance. Addressing this contradiction requires accessible sustainable alternatives and awareness initiatives to shift purchasing behaviors toward ethical fashion. Research on Nepal's education system identifies key challenges such as political instability, resource limitations, and disparities between public and private institutions. Recommendations include curriculum modernization, investment in teacher training, and equitable access to education to support long-term socio-economic progress.

Social equity in conservation efforts is also explored through a study on Rwanda's national parks compensation fund, evaluating community perceptions of wildlife damage reimbursement mechanisms. The findings suggest that enhanced transparency and direct community involvement can improve policy effectiveness and trust, strengthening conservation efforts. These interdisciplinary studies provide a foundation for shaping inclusive, sustainable, and resilient communities worldwide.

Building the Institutional Capacity for Third-Party Stakeholders in Advancing Hydropower Projects: The Case for Sarawak Energy Berhad

Bryan Paul, Arthur Aldy Anak Kilon, Azyan Binti Abdullah, Carldrick Anak Junatan Jimbun, Mohammad Irwan Aman, Darylynn Chung Yiu Li, Dayang Zanariah Binti Abang Kashim, Mohd. Firdaus Bin Ibrahim, Nur Khairin Binti Bujang, and Justin Lim Guan Chun

Sarawak Energy Berhad, Sarawak, Malaysia

Abstract: Hydropower projects are vital to Sarawak's strategy for becoming a regional renewable energy leader and advancing its sustainability agenda. However, their success hinges on the institutional capacity of stakeholders to collaborate effectively, manage risks, and address complex regulatory and social challenges. The involvement of diverse third-party stakeholders—such as government agencies, local communities, and non-governmental organizations (NGOs)—throughout the project lifecycle underscores the need for robust stakeholder engagement and capacity-building efforts.

This paper investigates the challenges faced by Sarawak Energy Berhad (SEB), Malaysia's leading energy provider, in understanding and fulfilling the needs of its third-party stakeholders. Employing a qualitative research approach, including interviews, workshops, and policy reviews, the study highlights gaps and obstacles in stakeholder participation during the development of large-scale hydropower projects. Key challenges include ensuring alignment with international sustainability standards, managing conflicting stakeholder interests, and fostering effective communication and collaboration.

Based on SEB's experiences, the paper provides actionable recommendations for energy providers to strengthen institutional frameworks, enhance stakeholder engagement, and align with international best practices for social and environmental sustainability. These insights aim to facilitate effective partnerships that support hydropower development while addressing community and environmental concerns.

This research contributes to a nuanced understanding of institutional dynamics in hydropower projects, offering practical guidance for utilities, policymakers, and stakeholders globally. By addressing the challenges of stakeholder participation, the study underscores the importance of institutional capacity in advancing sustainable energy initiatives.

Keywords: *Institutional capacity, Hydropower projects, Third-party stakeholders, Sarawak Energy, Sustainability*

An Innovative Product Design Strategy: The Technique of "Insightful Design"

Wen-Sheng Wang, and Yann-Long Lee
Chaoyang University of Technology, Taichung, Taiwan

Abstract: This study introduces "Insightful Design," a novel design methodology aimed at fostering creativity in product development. The proposed method incorporates four key steps: Ideation, Insight, Bricolage, and Integration, effectively capturing the iterative funnel-shaped process of design thinking through alternating divergent and convergent phases.

The methodology begins with Ideation, generating abundant solutions to user problems. The Insight phase enables designers to identify links between user needs and solutions, streamlining the process and reducing the time required for systematic comparisons. Bricolage facilitates semi-intuitive matching of needs and solutions, promoting creative connections. Finally, the Integration step merges these elements into cohesive, innovative design outcomes.

The effectiveness of this method was validated through its application to five designs that were recognized in competitions themed by the Taipei World Design Capital. These results highlight the method's ability to enhance creativity, linking user-centric needs with innovative solutions. "Insightful Design" offers a robust framework for tackling complex design challenges, advancing the practice of design thinking.

Keywords: *Design method, Insightful Design, Bricolage, Design thinking, Product innovation*

Emotional Intelligence as a Predictor of Job Satisfaction in the Nigerian Construction Industry

Adedayo Ogungbile[1], Ayodeji Oke[2], and Oluwaseyi Awodele[2]

[1] Hong Kong Metropolitan University, Ho Man Tin, Hong Kong
[2] Federal University of Technology Akure, Ondo, Nigeria

Abstract: This study investigates the role of Emotional Intelligence (EI) as a predictor of job satisfaction within the Nigerian construction industry. The research employs a combination of mean comparison and correlation analysis to examine how EI influences job satisfaction across various demographic and professional categories in this dynamic and demanding sector. The findings reveal a significant positive correlation between EI and job satisfaction, highlighting EI as a critical factor in employee well-being.

Gender-based analysis indicates that male employees generally report higher EI and job satisfaction levels than their female counterparts. However, the impact of EI on job satisfaction is notably more pronounced among women. Further exploration of trait EI and job satisfaction categories reveals a positive association with overall job satisfaction, though no significant relationship is observed with supervisor-related satisfaction. Employees are classified into four EI categories, consistently showing that higher EI levels correspond to increased job satisfaction, reinforcing findings from existing literature on EI's importance in workplace satisfaction.

The study concludes that fostering EI among construction industry professionals can significantly enhance job satisfaction and overall performance. Organizations are encouraged to incorporate EI training into their professional development programs, promoting a more satisfied and effective workforce. By prioritizing EI, construction companies can improve workplace dynamics and employee retention in this high-stakes environment.

This research underscores EI's pivotal role in the Nigerian construction industry's human resource strategies, offering valuable insights for industry stakeholders and researchers aiming to create more supportive and productive work environment.

Keywords: *Emotional intelligence, Job satisfaction, Nigerian construction industry, Workforce development, Employee well-being*

Navigating Cognitive Dissonance: Gen Z's Commitment to Sustainability and Fast Fashion Practices

Jannatul Ferdoush Oisy, Nawreen Chowdhury Adeeba, and Talbia Binte Borha
Independent University, Bangladesh, Dhaka, Bangladesh

Abstract: The paradox between Gen Z's strong commitment to sustainability and their significant consumption of fast fashion reveals a critical disconnect in their consumer behavior. This study explores the factors driving this contradiction, focusing on the motivations, barriers, and influences that lead Gen Z to purchase fast fashion despite their awareness of its environmental and ethical implications.

Fast fashion, characterized by rapid production, fleeting trends, and high environmental costs, presents a significant challenge to sustainability efforts. The rise of online fast fashion shopping, driven by affordability and convenience, further complicates this issue as these factors often overshadow ethical considerations.

Employing a mixed-methods approach, the study combines quantitative surveys and qualitative focus groups targeting individuals aged 18–30. Surveys evaluate sustainability awareness, purchasing behavior, and attitudes toward fast fashion, while focus groups explore psychological, cultural, and social drivers. Data analysis incorporates thematic coding for qualitative insights and statistical tools for quantitative trends.

The findings highlight a complex interplay of factors, including affordability, accessibility, and the powerful influence of social media, which amplify the appeal of fast fashion. Immediate gratification, peer influence, and a preference for trendy clothing often overshadow sustainability concerns, creating cognitive dissonance. Key barriers, such as the limited availability of affordable, sustainable alternatives and the pervasive marketing dominance of fast fashion brands, further entrench this behavior.

The study concludes that while Gen Z values sustainability, systemic and cultural obstacles hinder their ability to align values with actions. These insights underscore the need for sustainable fashion brands to provide accessible, cost-effective alternatives and for policymakers to support initiatives promoting sustainable consumption. Addressing these challenges is essential to bridging the gap between awareness and action in Gen Z's consumer behavior.

Keywords: *Sustainability paradox, Gen Z consumer behavior, Cognitive dissonance, Fast fashion, Sustainable consumption*

Education System of Nepal: Challenges and Way Forward

Ramchandra Lamichhane
Paribartan Neoal, NGO, Bharatpur, Nepal

Abstract: Education is pivotal to the development of any nation, shaping individuals, society, and the economy. In Nepal, the importance of education is recognized but not yet fully realized. Despite efforts over the past two decades to enhance the quality of education, numerous challenges persist. These include issues related to equity, quality, funding, integration of technology, governance, and infrastructure. For Nepal to achieve sustainable development, the education system must be dynamic, practical, and inclusive.

The education structure in Nepal comprises levels from primary schooling to university education. The formal education framework includes basic, secondary, and higher levels, spanning early childhood education to doctoral studies. While the structure itself is well-defined, its management and implementation reveal significant shortcomings. Despite improvements, such as an increase in literacy from 54% twenty years ago to 70% in 2021, the system is hindered by political instability, economic constraints, and limited resources.

Several critical challenges plague Nepal's education system. These include political interference, outdated teaching methods, insufficient use of technology, over-reliance on textbooks, and a lack of curriculum updates aligned with global standards. Additionally, disparities between public and private schools highlight systemic inequities. Public schools often suffer from inadequate facilities, teacher absenteeism, and poor teaching practices, while private schools are criticized for being overly profit-driven. Rural and underprivileged areas face further disadvantages due to a lack of infrastructure, difficult geography, and socio-economic barriers.

To address these challenges, Nepal must prioritize strengthening public education, updating curricula to meet international standards, and ensuring equitable access to quality education. Investment in teacher training, infrastructure, and technology is essential. Policies should focus on decentralizing higher education institutions to reduce regional disparities and creating mechanisms for better governance and accountability. By addressing these systemic issues, Nepal can create an education system that supports holistic development and prepares its citizens for the demands of the modern world.

Keywords: *Education, Challenges, Nepal, Equity, Educational reform*

An Assessment of Community Perceptions on the Compensation Fund for the Conservation of Rwanda's National Parks

Emmanuel Nsabimana

Kitabi Integrated Polytechnic Regional College, Rwanda Polytechnic, Huye, Rwanda

Abstract: The Government of Rwanda (GoR) has established a compensation fund to mitigate damages caused by wild animals from national parks, governed by Law No. 52/2011, which created the Special Guarantee Fund (SGF) for automobile and wildlife-related damages. The fund aims to balance conservation efforts and community well-being, making local involvement and awareness crucial for its effectiveness.

This study evaluated community awareness and perceptions of Rwanda's 5% compensation policy for national park conservation, focusing on three key areas: community residents' awareness of the SGF, their perceptions of the compensation process, and their views on the fairness of the fund in mitigating wildlife damages. Targeting households around Akagera, Nyungwe, and Volcanoes National Parks, the research collected responses from 993 households and consulted conservation experts for broader insights.

The findings revealed that while 64% of respondents were aware of the SGF, 83.5% reported minimal involvement in the compensation process, and 86.6% believed the fund inadequately addressed damages caused by wild animals. Conservation experts emphasized the need for greater community participation, from reporting and assessing damages to determining compensation values, as essential for fostering trust and improving the fund's impact.

To enhance the fund's effectiveness, the study recommends (1) establishing clear guidelines for claiming procedures, (2) developing standardized assessment forms accessible to beneficiaries, and (3) restructuring fund management by integrating it into the Rwanda Tourism Agency, which has stronger ties to local communities, or deploying an SGF representative within the agency to directly address community concerns.

By addressing these gaps, Rwanda can strengthen the alignment between conservation objectives and community welfare, ensuring the compensation fund achieves its intended goals of mitigating wildlife damages while promoting sustainable conservation efforts.

Keywords: *Compensation fund, Community perceptions, Conservation, National parks, Wildlife damages, Rwanda*

Electric Cargo Bikes for Sustainable Urban Logistics

Natalya Shramenko, Vladyslav Shramenko, and Christoph Hupfer
Karlsruhe University of Applied Sciences, Karlsruhe, Germany

Abstract: This study evaluates the efficiency of electric cargo bicycles as a sustainable alternative to cars for transporting small goods consignments in urban areas. It focuses on optimizing delivery routes under dynamic urban conditions characterized by uncertainty factors, such as product availability at loading points. A simulation model was developed to analyze cargo transportation routes, comparing different delivery technologies—pendulum routes and distribution-assembly routes—using electric cargo bikes and cars as the primary modes of transportation.

The modeling process optimized operational parameters, including vehicle carrying capacities, travel times, and distance constraints, ensuring all delivery timelines were balanced across different vehicle types. The simulations demonstrated that electric cargo bikes offer significant advantages over cars in urban logistics. These advantages include reduced emissions of harmful substances, lower energy consumption, and decreased delivery costs. Moreover, cargo bikes increase operational flexibility for logistics companies and contribute positively to urban environments by freeing up street space, reducing noise pollution, and minimizing the need for parking infrastructure.

The findings highlight the potential of electric cargo bikes to transform urban logistics by combining economic, environmental, and social benefits. This research underscores the importance of integrating sustainable transportation solutions into urban delivery systems, paving the way for cleaner and more efficient logistics operations.

Keywords: *Urban logistics, Cargo bike, Simulation model, Delivery route, Sustainable transportation*

Improving the Livelihoods of Cherimoya Producers in San Mateo de Otao: Financial, Social, and Human Capital Dimensions

Jonatán Edward Rojas Polo, and José M. Gil Roig

Pontifical Catholic University of Peru, San Miguel, Peru

Abstract: Value chains are critical drivers of national development, yet weakly articulated systems often lead to inequality among productive links, leaving upstream suppliers and rural farmers trapped in poverty. In Peru, agribusiness contributes over 18.5% of GDP, yet rural agriculture remains marginalized, characterized by incomes below the minimum wage, limited access to essential services like health, energy, and water, and low education levels. These conditions perpetuate a cycle of poverty and unproductivity, highlighting the need for interventions to strengthen value chains and livelihoods in rural communities.

This research focuses on redesigning the cherimoya production chain in San Mateo de Otao by enhancing financial, social, and human capital dimensions to promote sustainable value generation. To address financial challenges, interviews with local financial institutions identified risk factors that hinder credit access for farmers. A credit scoring model was developed to evaluate these barriers, demonstrating that capital injection plays a vital role in enabling productive systems and fostering growth. In the social dimension, the study examined the production strategies of both individual and partnered farmers, uncovering variables that limit productive collaboration and associativity among producers. By addressing these constraints, the study aims to strengthen social cohesion and cooperative strategies.

Human capital was also analyzed using a mathematical-statistical model that connects variables of human capital with sustainable development goals. This approach evaluates the quality of life among cherimoya farmers, identifying areas such as education, health, and productivity that require targeted improvement. Finally, the research proposes a redesigned supply chain that strengthens the connection between farmers and market links, facilitating a more equitable distribution of value. This new structure is projected to increase farmers' economic income by approximately 40%, promoting shared prosperity and sustainability.

By addressing financial, social, and human capital dimensions, this study offers a comprehensive framework for improving rural livelihoods and enhancing the sustainability of the cherimoya value chain in San Mateo de Otao.

Keywords: *Cherimoya livelihoods, Articulation of the cherimoya value chain, Sustainable value chain, Rural agriculture, Livelihoods improvement*

Temporal Study of the Spatial Correlation Between Urban Land Planning and Urban Heat Island Patterns in Bogota, Colombia

Daniel Felipe Coy Castro, Juan Manuel Coy Castro, Cristian Salas Perez, Erika Sofía Upegui, and Pablo Andres Coy Castro

Pontifical Javierian University, Bogota, Colombia

Abstract: Urban surface temperatures vary significantly based on land cover types, with a notable increase in temperature where green areas are absent. This study examines the growth and spatial correlation of urban heat islands (UHIs) in Bogotá, Colombia, over three time points: 1989, 1997, and 2018. A multi-temporal analysis was conducted, integrating remote sensing and exploratory spatial data analysis to investigate the patterns of surface temperature changes in the city.

Surface temperature (LST) data were derived from Landsat satellite imagery and correlated with NDVI (Normalized Difference Vegetation Index) and NDBI (Normalized Difference Built-up Index) spectral indices. Local spatial statistics, including the univariate Moran index (LISA) and the bivariate Moran index (BILISA), were employed to identify spatial autocorrelation patterns and the relationship between land cover types and temperature variations. The results indicate that vegetation cover significantly reduces surface temperatures, while high-density construction areas correspond to the highest temperature zones. These findings emphasize the inverse relationship between vegetation and urban heat.

This study presents a novel methodology for understanding the temporal evolution of heat islands and identifying the types of land cover influencing urban temperature increases in a city without distinct seasons. By correlating urban planning with spatial temperature patterns, the research underscores the critical role of green spaces in mitigating UHI effects. These insights contribute to informed territorial planning and climate resilience strategies for rapidly urbanizing regions.

Keywords: *Urban heat islands, Spatial analysis, Coverage change, Urban development, Spatial autocorrelation, Climate change, Landsat satellite images, Territorial planning*

Location Proposal for a Bioethanol Production Plant Using the AHP-GIS Multicriteria Methodology in Valle del Cauca

Nicolas Perez, Maria Fernanda Eraso, and Alvaro Jose Torres Penagos
University of Valle, Valle del Cauca, Colombia

Abstract: The growing global demand for sustainable energy sources has intensified efforts to find alternative solutions to the challenges posed by fossil fuel depletion and climate change. Bioethanol production from organic waste, particularly coffee residues, offers a promising pathway toward achieving circular economy objectives while addressing energy needs. This research focuses on identifying optimal locations for bioethanol production plants in coffee-producing regions, specifically in Valle del Cauca, Colombia, to maximize resource utilization and promote sustainable development.

The study employs a multidisciplinary approach that integrates environmental policy analysis, multicriteria decision-making (AHP), and Geographic Information Systems (GIS) to propose a comprehensive methodology for plant location analysis. Key factors influencing location decisions are identified by characterizing the environmental, economic, and social dimensions of bioethanol production. Using the Delphi method, expert opinions help prioritize criteria such as proximity to waste sources, transportation infrastructure, and socio-economic factors, ensuring alignment with sustainability goals.

By combining AHP with GIS spatial analysis, the study evaluates location alternatives against these criteria, facilitating informed decision-making that balances environmental sustainability, economic viability, and social considerations. The GIS-based spatial analysis reveals regional dynamics, enabling the identification of strategic sites that optimize resource use and minimize environmental impact.

The findings are expected to inform policy and industry practices in the bioethanol sector, encouraging sustainable waste management and energy production. This research highlights the importance of collaboration among academia, industry, and government stakeholders to advance circular economy principles and renewable energy initiatives. The proposed methodology offers a scalable framework applicable to biomass-based energy projects worldwide, contributing to a more sustainable and resilient energy future.

Keywords: *Bioethanol production, AHP-GIS methodology, Circular economy, Sustainable energy, Coffee residues, Renewable energy planning*

Comprehensive Disaster Support in Multicultural Societies in Japan: A Gender Perspective

Yinhe Quan

Waseda University, Tokyo, Japan

Abstract: In Japan's increasingly diverse society, the integration of gender-sensitive and culturally inclusive approaches in disaster management is critical for promoting equity and effective recovery. This research explores how incorporating gender perspectives into disaster support frameworks enhances social inclusion and economic sustainability. By addressing the unique needs of diverse cultural and gender groups, tailored disaster interventions can foster resilience and strengthen recovery efforts.

The study employs a literature review, case studies from multicultural communities, and stakeholder interviews to assess the impact of gender-sensitive disaster strategies. Findings reveal that addressing gender-specific needs, such as safe spaces, targeted resources, and culturally appropriate communication, improves the inclusivity and responsiveness of disaster systems. These measures not only enhance immediate relief but also contribute to long-term community resilience and economic recovery.

The research concludes that integrating gender considerations into disaster management frameworks ensures equitable support for all community members, fostering robust and inclusive recovery processes. By adopting gender-sensitive approaches, policymakers and practitioners can strengthen social cohesion and economic stability, building more resilient multicultural communities.

Keywords: *Gender-sensitive disaster management, Multicultural societies, Social inclusion, Economic sustainability, Japan*

Factors Influencing the Self-Confidence and Self-Esteem of Unemployed Young Women in Vavuniya District, Sri Lanka

Anver Hayathu Mohamed

PALM Community Development Services Company (Guarantee) Ltd, Batticaloa, Sri Lanka

Abstract: This research investigates the factors affecting the self-confidence and self-esteem of unemployed young women in the Vavuniya District of Sri Lanka, a region grappling with socio-economic challenges, including high unemployment rates among educated women aged 18 to 30. Despite significant governmental investment in education and skill development, a persistent gap exists between educational attainment and employment outcomes, highlighting inefficiencies in addressing female youth unemployment.

Drawing on human capital and structural unemployment theories, the study examines how socio-economic, cultural, and institutional dynamics impact the self-esteem and self-confidence of young women. Key factors analyzed include job market trends, employer expectations, cultural norms, patriarchal attitudes, and access to online social support systems, such as digital networking and mentorship. These variables were quantitatively measured through surveys and qualitatively explored via interviews, providing a holistic understanding of their influence.

The research highlights significant barriers, including skills mismatches, limited access to formal employment, and insufficient confidence-building initiatives within existing skill development programs. The role of online platforms in facilitating alternative employment opportunities and self-employment was also evaluated, particularly in rural settings like Vavuniya. A mixed-methods approach was employed, with data collected from 150 unemployed young women across 15 Grama Niladhari Divisions through stratified sampling. Insights from structured questionnaires and in-depth interviews revealed critical challenges and areas for policy improvement.

The findings offer actionable recommendations for policymakers, educators, and community leaders. Strategies include enhancing skill development programs tailored to the needs of educated young women, promoting self-employment, and addressing socio-cultural barriers to economic participation. By tackling these structural and psychological barriers, the study aims to contribute to gender equity, economic growth, and social stability in Sri Lanka.

Keywords: *Self-confidence, Self-esteem, Youth unemployment, Gender equity, Skill development, Sri Lanka*

E-Waste Disposal: Analyzing Consumer Behavior and Awareness among Management Students

Sachin Deshmukh[1], and Anil Sharma[2]

[1] Dr. Vishwanath Karad MIT-World Peace University, Pune, India
[2] Parul University, Gujarat, India

Abstract: The rapid growth of electronic devices has resulted in a surge of electronic waste (e-waste), posing significant environmental and health risks. This study investigates consumer behavior and awareness regarding e-waste disposal among management students, a group poised to influence future business and sustainability practices. Through a comprehensive survey and empirical analysis, the research assesses students' awareness, attitudes, and disposal practices, providing insights into the effectiveness of educational interventions and areas for improvement.

The findings reveal that educational programs significantly enhance responsible e-waste disposal behavior, with a path coefficient of 0.789, underscoring their importance. Additionally, awareness of e-waste issues positively impacts the success of such interventions, with a path coefficient of 0.623. The study emphasizes the importance of demographic factors, particularly the role of young, highly educated individuals, in shaping sustainable practices. However, the analysis of constructs, such as 'E-Waste Disposal Behavior,' highlights areas requiring further refinement, as suggested by the Average Variance Extracted (AVE) results.

The research underscores the necessity of integrating e-waste management education into management curricula and expanding access to disposal facilities to promote responsible practices. By addressing gaps in awareness and behavior, educational institutions and policymakers can create strategies that foster sustainable e-waste management. This study provides a foundation for enhancing environmental responsibility among future business leaders.

Keywords: *E-waste, Consumer behavior, Awareness, Sustainability, Management education, Responsible disposal practices*

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