

WSF
2023

The 10th World Sustainability Forum

14 September 2023

Singapore, Basel, Toronto & virtual

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The 10th World Sustainability Forum

Singapore | Basel, CH | Toronto, CA | virtual, International
14 September 2023

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Welcome from the Global Chairs

The 10th World Sustainability Forum (WSF2023) will be a 24-hour event, held in 3 locations, as well as online. We believe that this will optimize worldwide participation in this global event.

The forum will have four main subjects distributed in three locations:

Kicking off in Singapore, the focus will be on sustainability for social community impact. We will then move onto Basel, where our Chairs will lead discussions on sustainability in the industry, and at university and corporate settings. Finally, our last hub in Toronto will focus on sustainability in the built environment.

WSF2023 is part of a global sustainability forum series that is organized by and supported by MDPI. As a hybrid event, it will provide scholars with the opportunity to attend the event in person at one of the three conference sites or, most sustainably, online. Arrangements have been made for a state-of-the-art online event.

We are particularly hoping to address STEM research with the social sciences and policy makers.

We look forward to welcoming you across the globe and virtually!

Kind regards,



Prof. Dr. Max
Bergman



Prof. Dr. Edwin
Constable

Singapore Hub Abstracts

Talks

Applying the ‘Learning Journey’ Approach to Understand, Adapt and Mitigate Food System Responses to Climate Change: The Case of the Breede Valley, South Africa

sciforum-073460

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² *Stellenbosch University*

Adapting to and mitigating the impact of climate change on local food systems is a complex task involving multiple actors who may have conflicting needs. Policy responses and the design of specific interventions require resources and behaviour change if they are to have a sustainable impact. Evaluations of such interventions report disappointing results when community buy-in is limited. ‘Learning Journeys’ may be an innovative option to achieve such buy-in. These derive from Participatory Action Research involving ‘facilitated dialogues’ whereby a broad and inclusive range of participants undertake a physical journey to explore a complex system, in this instance the ‘food system’. The objective is to gain first-hand experience of challenges and investigate ‘territorial’, or local, solutions to these challenges. Learning Journeys provide both an opportunity to assemble a co-produced knowledge base and a means for the co-design of interventions. Whilst doing so, new relationships and networks are built that help to engender commitment to drive the interventions. In the Breede Valley, a rich agricultural area in South Africa, a sequence of Learning Journeys have formed part of a joint initiative of the sub-national governments, and researchers. The objective is to identify and then implement strategies to improve the resilience of the local food system in the context of global change. The journeys reveal the experiences of stakeholders as they respond to unseasonal and torrential rainfall, new patterns of temperature fluctuation, high wind gusts, and drought. This paper describes the activities that comprised these Learning Journeys and then analyses the extent to which the approach can contribute towards the co-design of interventions, and stimulate innovation. However, limitations and potential contradictions are also identified. These need to be addressed if the approach is to be scaled out to other territories.

Salinity Reduction of Borneo Tropical Brackish Peat Water with Electrocoagulation Treatment

sciforum-073786

Nazeri Abdul Rahman, Calvin Jose Jol, Allene Albania Linus, Chieng Kwong Ming

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Sarawak, located on Borneo Island, has a vast availability of brackish peat water sources, especially in some coastal rural areas. However, brackish peat water is currently underutilized as the source for water treatment plants in the state due to excessive salinity levels. As such, this study aims to investigate the salinity reduction in brackish peat water sources for domestic consumption in Sarawak coastal rural areas by utilizing continuous electrocoagulation treatment with aluminium electrodes. Correspondingly, this study analyzes the effects of seawater percentage, electric current, and flow rate on salinity reduction with electrocoagulation treatment. This study has found that the treated salinity levels in brackish peat water with 30% of seawater percentage meet the Malaysia Class I standard in National Water Quality Standard. The study has also identified both monolayer and multilayer adsorption that occur in electrocoagulation treatment as the precursor to salinity reduction. In addition, the presence of in situ aluminium hydroxides coagulants could adsorb some sodium chloride from brackish peat water with 70% of adsorption rate. From the statistical analysis conducted, this study found that electrocoagulation treatment could achieve 91.78% of maximum salinity reduction efficiency with an optimum electric current of 5 A and flow rate of 1.2 L/min in brackish peat water with a 30% of seawater percentage. This treatment system costs only RM 0.29 per meter cubic of treated brackish peat water at optimum conditions. Overall, this study demonstrates that continuous electrocoagulation treatment could reduce the salinity levels in brackish peat water with 30% of seawater percentage which is considered safe for domestic consumption in Sarawak coastal rural areas at reasonable cost.

Technical and Economic Feasibility of Crab Cultivation Using Aquaculture-Photovoltaic Methods for Sustainable Development Goals in the Blue Economy Development at Mangrove Areas in Indonesia

sciforum-074660

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Mangrove areas have become one of the most important biological ecosystem resources in coastal regions. The total area of the world's mangrove forests in 2000 was 137,760 km², spread across 118 countries in tropical and sub-tropical regions. Indonesia is the country with the largest area of mangrove forests in Asia (and the world), with an area of 3.062.300 hectares. (Giri et al., 2011; Joandani et al., 2019; Wahyuningsih, 2021). One of the most popular mangrove commodities in Indonesia is mangrove crab (*Scylla serrata*). Mangrove crab has high economic potential in the domestic and global markets, as seen by the enormous increase in average export value each year, reaching 20.4%. (Indonesia Ministry of Maritime Affairs and Fisheries, 2018). The majority (61.6%) of the mangrove crab demand is still caught in nature, while only a small portion (38.4%) is cultivated (Saidah et al., 2016). Continuously taking crabs from the wild without making any effort to cultivate them will decrease their availability and might even hasten their extinction. Implementing aquaculture-photovoltaic for cultivating magrove crabs is one of the solutions. This method combines the crab house method with an off-grid photovoltaic and battery system. In addition to increasing the production of mangrove crabs for the development of blue economy concepts in the Magrove Area, this method also supports the SDGs policy through the use of photovoltaic as a renewable energy source. The design of a 3.3 kWp photovoltaic system with a 24 KWh battery system for a capacity of 300 crabs is used to demonstrate technical feasibility. Benefit–cost ratio, payback period, and net present value are used to analyse economic feasibility. The application of crab cultivation using aquaculture photovoltaic technology was found to be acceptable for implementation with a value–benefit–cost ratio > 1.0 and positive net present value.

Shaping the Future of Sustainability through the Common Core Curriculum (CCC): An Innovative Sustainable Education Approach in Singapore

sciforum-074618

Yunn Chyi Chao, Lee Yee Lim, Teresa Chua-Moraes, Ying Ying Soh, Lay-Ping Kwa

Singapore Polytechnic

In an era of rapid change and disruption, the need for future-focused sustainable education is of the utmost importance.

This presentation introduces Singapore Polytechnic's Common Core Curriculum (CCC), an innovative educational effort aiming to provide students with the human-centric and digital skillsets they will need to navigate the future sustainably.

The CCC is an interdisciplinary learning experience that emphasizes critical thinking, empathy, and proactive participation in real-world sustainability challenges. It is uniquely built around the United Nations' Sustainable Development Goals (UN SDGs). The curriculum strives to promote a comprehensive awareness of the complex sustainability difficulties we face today, not just today, but also in the future, with a particular emphasis on the local context of Singapore, as seen in the Singapore Green Plan. The construction of the CCC includes the integration of interdisciplinary skills (human skills and emerging digital skills) in modules such as Persuasive Communication and Data Storytelling.

Recognizing that students may consider sustainability to be a foreign idea, the CCC strives to demystify it by incorporating it within ten core compulsory modules. This whole-of-Singapore Polytechnic approach not only gives all students knowledge of sustainability challenges but also allows them to envisage and have a hand in working out solutions to build a more sustainable future in Singapore, ASEAN, and the world.

This presentation will explore the potential of CCC to drive sustainable social and community impact for the future. At the same time, it will also highlight the collaborative efforts within the polytechnic to co-create the modules. Thirdly, students' feedback on their understanding of the UN SDGs and sustainable solutions for the future will be shared. Finally, challenges encountered in implementing this innovative curriculum will be discussed.

Integrating the UN-SDGs' Value Creation and Sustainability Evaluation Across a Construction Project's Life Cycle

sciforum-074559

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The triple bottom line (TBL) promotes economic, social, and environmental sustainability. TBL-based sustainability is embodied in the UN-SDGs, which have 17 goals, 169 targets, and 231 distinct indicators. The building and construction (B&C) sector is vital to the UN-SDGs, yet it struggles to achieve sustainable socio-economic deliverables with minimal environmental and climatic issues. To overcome this obstacle, B&C stakeholders must evaluate and improve UN-SDGs (TBL-based) value generation across the project's whole life cycle and beyond. SDGs value created is a function of evaluating inputs, activities, outputs, outcomes, and impact created in different phases of a project. And, in evaluating SDGs value created, green/sustainable building and construction assessment tools/schemes have a critical role to play.

However, current tools/schemes are biased towards gauging environmental sustainability with a low consideration of social and economic dimensions. Most of the assessment tools and respective criteria (credits) are concerned with the design, construction, and operation and maintenance phase of a project; the conception and demolition/decommissioning are not explicitly considered. For capturing life-cycle-based SDGs value creation, tools/schemes have to continuously and comprehensively evaluate TBL (social, economic, and environment)-based sustainable inputs, activities, outputs, outcomes, and impacts across life-cycle phases. Therefore, a framework that focuses on TBL based life-cycle sustainability assessment, at the same time ensures SDGs value creation in each phase of construction projects is required. In this context, the current work presents the potential set of TBL-based sustainable inputs, activities, outcomes, and impacts across life-cycle phases in a typical construction project. These identified set of inputs, activities, outcomes, and impacts are then mapped across various goals and respective targets of the agenda.

Reimagining Sustainable Living in the Anthropocene: A Document Analysis for Climate Resilience Policy Making in Malaysia

sciforum-074266

Mufaro Chitsa

Universiti Teknologi PETRONAS

Malaysia's commitments to climate change reduction were recently shown with the outcome of the United Nations (UN) Climate Change Conference 2021 (COP26) where Malaysia expressed a need to come up with a clear plan to meet the commitments that were set to help reduce climate change in the country. Malaysia expressed a need to approach climate adaptation and mitigation with an all of government and whole of society approach. This same approach is also one that is long recognized by the United Nations (UN) and World Health Organization. Crucial to the whole of society approach is the adoption of the concept of citizen participation and its mechanisms, where all community members are aware and are at the forefront in helping to create resilient communities. As the local community is also affected by climate change disaster events, it is crucial that they are well prepared and equipped with the right tools and information they need if disaster occurs. The results of the COP26 on Malaysia's way forward to tackle climate change also show a need for the government to have ongoing consultation processes that include civil society organizations. The whole of society approach through citizen participation will help in building climate resilient communities. The whole of society approach has also been implemented in policy making procedures where systemic local citizen participation for climate resilience and sustainability takes center stage in the formulation of climate related urban planning and development guidelines, policies, and acts. This presentation, hence, aims to discuss the results of a document analysis conducted on existing climate change guidelines, policies, and acts in Malaysia to find out the extent to which citizen participation was incorporated in the formulation of these documents for a whole of society outcome.

Singapore Hub Abstracts

Poster Exhibition

Microbiological Environmental Restoration: The Bioremediation Key for Electroplating Wastewater Containing Heavy Metals

sciforum-074683

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Facultad de Ingeniería, Universidad Anáhuac

In Latin America, nearly 36 million people live without clean water every day, and the limited resource they only have access to is actually polluted with industrial waste which can contain heavy metals. The current investigation is based on the growing interest to reach a circular economy-based alternative aiming to restore polluted bodies of water with electroplating industry's effluent, which contain ammonium, copper, nickel, and EDTA, among others. These can cause lung edema, pneumonia, and directly affect the liver. Bioremediation techniques were tested with micro-algae (phytoplankton) and micro-fungi (*Rhizopus oryzae* and *Trichoderma harzianum*), due to their affordable, biotechnological, and environmental advantages. To measure the pollutant removal percentage, Atomic Absorption Spectrophotometry (AA), Infrared Spectrophotometry (IR), and Scanning Electron Microscope (SEM) techniques were implemented, which showed that the species of micro-fungi *Rhizopus oryzae* removed 35.31% of Cu and 68.65% of Ni, followed by the efficiency phytoplankton showed, and the *Trichoderma harzianum* had the lowest removal capacity, with 6.1% of Cu.

Sustainable Development of Society Based on Technology Transfer

sciforum-074051

Zhanna Mingaleva, Vladimir Postnikov

Perm National Research Polytechnic University

Achieving the SDGs involves organizing an effective process of technology transfer from their developers to users. This process is ensured through various mechanisms, one of which is the transfer of technologies from scientific organizations and universities to real production and society. At world-famous universities, the processes of the dissemination of new knowledge and technologies from universities to industry and other sectors of the economy are carried out through the creation of special units, called "technology transfer offices". These divisions are responsible for the formation of the university business model of technology transfer through the use of various mechanisms for the transfer of knowledge and technology to the economy, industry, and society. Russian universities and regional communities are increasingly involved in the system of creating, transferring and applying technologies to solve the problems of sustainable development of society. The report presents the results of promoting best practices in organizing the activities of a technology transfer center of a large Russian technological university as a special unit of the university responsible for the entire value chain in the transfer of innovative technologies to external users, and identifies key areas for transforming university business models in terms of their compliance with the modern innovation ecosystem.

Toward Sustainable Development: A Community-Level Framework for Evaluating Interrelated Challenges in Bhaktapur, Nepal

sciforum-074055

Kailynn Miller, Marcus Young

Brigham Young University

This presentation explores the topic of measuring communities in terms of international development through the aid of a framework. Existing frameworks offer selective attention to social issues on the macro level. This highlights a need for a generalizable meso-level framework that analyzes a community and its existing interrelated problems. The decision was made to focus on chronic obstructive pulmonary disease (COPD) in individuals working in brick kilns located in Bhaktapur, Nepal. Using the United Nations Sustainable Development Goals (SDGs), which are one of the most comprehensive frameworks for evaluating society's progress, an alternate framework was created to better focus on members of the community as the unit of analysis. Doing so allowed a wider perspective of interrelated contributing factors connected to the focal issue of COPD. This was pilot-tested using a mixed-methods approach of participant interviews, direct observation, and analyzing environmental samples. The findings presented in this presentation outline a number of interrelated social issues, related to inadequate physical infrastructure, social systems, and deteriorating natural environments. Additionally, several interesting observations are presented, which relate to religion, family life, and culture. The analysis suggests that while the SDGs do provide a wide perspective from which to draw out a community-level evaluation framework, significant gaps exist. Understanding these gaps and refining the framework will lead to an effective community-scale tool to help prevent insensitive solutions, unsustainable interventions, and negative impacts. Instead, it promotes a sustainable approach to community development through a deep understanding of specific locales while addressing multiple interrelated challenges simultaneously.

The Influence of Aquatic Ecosystem Health of an Urban Lake on the Suitability of Public Hydrophilic Recreation: A Case Study of Xuanwu Lake, Nanjing, China

sciforum-074648

Wangwei Cai

Hohai University

Urban lakes are important for public to enjoy water, and water ecosystem health (WEH) is the basis of sustainability of urban lake; however, the influence of WEH on the suitability of urban lakes for hydrophilic recreation remains unclear. The hypothesis of this study is that the WEH of an urban lake has a non-linear effect on the suitability of public hydrophilic recreation (HRS). In other words, when WEH is worse than a certain critical value, the HRS will be thoroughly lost. When it is better than the critical value, but worse than a certain upper value, the improvement of WEH will significantly enhance HRS. When it is better than the specific upper value, the influence of its change on HRS will be reduced to being negligible. Water quality data and plankton data were utilized to develop the Index of WEH (WEHI, $\in[0,1]$) for urban lakes. And the number of tourists and satisfaction evaluation from tourists were used to develop the Degree of HRS (HRSD, $\in[0,1]$). The influence of WEHI on HRSD was analyzed by non-linear regression. Taking Xuanwu Lake in Nanjing as an example (a famous imperial garden in Chinese history), a monthly survey and monitoring from January 2016 to December 2016 was carried out for basic data. The results show that when the real value of WEHI between 0.384 and 0.540, the Pearson coefficient between WEHI and HRSD has a significant positive correlation ($r=0.9856$, $P<0.05$); when $WEHI > 0.550$, the Pearson coefficient between them is not significant ($r=0.2518$, $P>0.05$); according to model prediction, when $WEHI = 0.100$, the value of HRSD will be $= 0$. The above results prove that the hypothesis is valid, which provides a basis for optimizing the management strategy of urban lake ecosystem and realizing the sustainability of urban lake ecological service function more effectively.

Life Cycle Analysis of Indian Fashion Designers: Mapping Financial Impact of Sustainability Practices

sciforum-074548

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National Institute of Fashion Technology, New Delhi India

This study was undertaken with the objective to understand the sustainability practices in place across the life cycle of Indian fashion designer-wear labels and their impact on the financial performance of the organisation. The authors also wanted to understand the financial metrics used by Indian fashion designers and how best their financial performance can be measured. For this purpose, in-depth interviews were conducted with the designer-founders of seven Indian designer-wear labels. A non-probability purposive sampling technique was employed to select these designers. The interviews were recorded and transcribed for data analysis. In vivo coding was used to analyse the data and codes were identified from the literature reviewed. These codes included design process, materials, waste, production, innovation, craft, resource, distribution, sourcing, stakeholders, afterlife, co-creation, communication, financial impact, and financial metrics. The data revealed themes across the life cycle of the products offered by these designer-wear labels. The practices of these designer-wear labels across the life cycle were pitted against the LCA sustainability benchmark model previously developed by the authors (Agrawal and Gandhi, 2022, doi: 10.22541/essoar.167388180.04670715/v1), and points of parity and difference were identified. The impact of sustainability practices on the financial performance of these organisations was also assessed. Recommendations were given for Indian designer wear labels to make their life cycle more sustainable and enhance their financial performance.

A Self-Learning-Based Modelling Method of BESS with Second-Life EV Batteries

sciforum-074659

Fred Wei, Zhi Qiang Cai

Singapore Polytechnic

When the SoH of an EV battery degrades to below 80%, the battery is usually considered no longer suitable for EV traction use and should be retired. It is a big issue to dispose of these retired batteries, especially as most EVs today use batteries with toxic heavy metals. Thus, the concept of second-life battery is introduced in recent research works trying to extend the lifespan of EV batteries, mostly for stationary applications, i.e., BESS.

After being retired from EV use, it is important to evaluate and verify the battery condition on a cell level to ensure safety and performance before proceeding with second-life application. Thus, a plug-and-play battery-testing platform consisting of a self-learning model is needed. The self-learning model will be updated automatically with real-time testing data and analyzes the status of the battery. The testing platform can tell the status of a battery and identify whether the battery is under normal or risky conditions with the updated model. Here, a self-learning-based modelling method is proposed to develop the battery model for second-life battery assessment.

A degradation study on battery cells is conducted under laboratory conditions until their SoH has been reduced to below 80% to obtain second-life batteries. After the battery model is developed, the retired EV battery will be tested and the testing data will be used to update the self-learning model. The updated model will identify the status of the battery and its health conditions.

Land-Water-Energy-Food Nexus Security: Pathway for Sustainable Development Goals to Sub-Saharan Africa

sciforum-073224

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The Land–Water–Energy–Food (LWEF) nexus are closely interlinked resources which are vital for human wellbeing, poverty reduction, and sustainable development. While the current concern to achieve LWEF nexus security falls under specific institutions. This creates trade-offs and hinders the achievement of sustainable development goals (SDGs) in Sub-Saharan Africa (SSA). This article points out the current status and the main challenges associated with meeting the SDGs 15, 2, 6, and 7 which strongly linked with the LWEF nexus. In order to assess this linkage, we used evaluation methodology that must be incorporated into the planning of SDGs evaluation across SSA. All of these have important implications for the SDGs evaluation and monitoring to clearly understand the progress. The assessment revealed that, in terms of LWEF nexus security, the SDGs performances were characterized with low performance in SSA. Despite significant progress over recent decades to achieve SDGs globally, Sub-Saharan Africa (SSA) remains the least successful in the world. This is characterized by high levels of poverty, which is linked with a lack of proper management of LWEF nexus resources. It was evidenced that 821 million people globally were without access to clean water, 40% live in SSA, and >320 million people lack access to safe drinking water. Likewise, one-third of the people suffering from chronic hunger and around 600 million people residing in SSA rely upon conventional solid biomass fuels as their principal energy resource, and 33% of SSA people are under food insecurity. This implies SSA lags so far behind in attaining SDGs 15, 2, 6, and 7. It is concluded that even though the SDGs are expected to provide a golden opportunity to the African Union super sustainable development Agenda of 2063, a very challenging endeavor considering the low starting point, and the rapid demographic, socio-economic, and environmental change. This study depicts that SSA is a wake up call for nationwide support.

Innovation and Drivers of Sustainable Recovery in Small and Medium-Sized Enterprises (SMEs) in Lao PDR During the COVID-19 Pandemic

sciforum-074056

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The COVID-19 pandemic has had a significant impact on the socio-economic development of the Lao People Democratic Republic (Lao PDR). Small- and Medium-Sized Enterprises (SMEs) in Lao PDR, which constitute over 94% of the country's enterprises, were particularly affected by the pandemic. This research aims to explore the drivers of changes and innovations in Lao SMEs during and after the COVID-19 pandemic, with a focus on business model innovation (BMI) and business sustainability performance (BSP). The research employs a combination of qualitative and quantitative analyses to examine the factors that influenced the changes and challenges faced by Lao SMEs during the pandemic. Additionally, it investigates the significant factors of innovative orientation (IO) in relation to business sustainability performance. The research evaluates IO, Total Quality Management (TQM), and BSP in terms of various dimensions, including product and service innovation, process innovation, market innovation, behavior innovation, and strategic innovation. The findings of this research contribute to the existing literature on the impact of COVID-19 on Lao SMEs, enriching the understanding of how these businesses managed to recover and adapt quickly. The economic implications of the research shed light on how Lao SMEs overcame economic shocks and supply chain shortages through business model innovation. Furthermore, the study offers policy implications for policymakers in formulating sustainable long-term policies to support SMEs during the recovery period. By assessing the business sustainability performance based on environmental, societal, and economic impacts, the study provides a comprehensive evaluation of the resilience and adaptability of Lao SMEs in the face of unprecedented challenges.

Challenges in Sustainability Reporting Performed by Food Organizations

sciforum-074071

Ilija Djekic – Keynote Talk

University of Belgrade

Main objective of sustainability reporting is to encourage food organizations to measure and openly reveal their sustainability impacts aligned with the three main pillars: economy, environment and society. There are different types of sustainability reporting tools and standards in place such as GHG Protocols, ISO 14064/ ISO 14067, Life Cycle sustainability assessment, GRI Sustainability Reporting Guidelines, IIRC Integrated Reporting Framework, SASB Materiality Map or ISO 26000). However, despite of these guidelines there are still many challenges confronting food organizations: (i) different reporting methods; (ii) variety of indicators used to depict sustainability outputs; (iii) lack of a common reporting legal framework. Although this type of reporting has the potential to advocate benchmarking throughout the food value chain continuum, it is difficult to compare food organizations operating in the same sector of the food value chain. Therefore, it is of utmost importance to clearly define: (a) how to define comparable reporting regardless of the size, type and ownership structure of food organizations; (b) role of the Sustainable Development Goals (SDGs) in benchmarking; (c) role of third parties in sustainability reporting, and (d) role of other stakeholders in the value chain and their inter-connection in sustainability reporting.

Hasten Low Carbon Transition Through Renewable Energy Communities in Lombardy: Evaluating Knowledge and Participation in the Private Sector

sciforum-073187

Maria Emilia Garbelli

Università degli Studi di Milano Bicocca

In light of a new vision of the energy sector, in 2019 the EU introduced the energy renewable communities (ERC) in its legislation, stimulating citizen participation as main recipients, public entity to spread knowledge and to head ERC, and small and medium enterprises (SME) to contribute (sustaining investments and plants, contributing to their transition to renewable energy sources too). Although the private sector participation is clearly stated and needed (and the industrial system plays a huge role, enabling the generation and management of the energy community, boosting energy transition and social involvement) it seems to be secondary. The legislation package on ERC is still in progress, but by now very few explain the direct involvement of SMEs. Academia has lacked a direct investigation of the point of view of an SME that is interested in entering into an ERC.

ERC implies first a cultural change, thus investments; this work investigates the point of view of the private sector in Lombardy, the leading Italian region for industrial development (one of the most industrialized of the whole EU), as Italy is the EU Country the most dependent from third-parties energy: as far as the Ukraine–Russia conflict rose, Italy felt severe consequences due to the EU constriction to Russia. Thus it is investing in ERC and the Lombardy Region is one of the leading in the Country for its commitment toward a concrete, and fast, energy transition enabling the area to autonomous generation and management of its energy needs.

A direct survey was generated and submitted during January 2023, collecting 300 answers, in order to perceive whether industrial SME know ERC, if they understand the related benefits, and if they are moving to be part of an ERC.

A Systematic Literature Review: Examining Eye-Tracking Studies on Eco-Friendly Food Choices

sciforum-073652

Tonia Ruppenthal

Fulda University of Applied Sciences Department of Nutritional, Food and Consumer Studies

Consumers are confronted with a wealth of information when purchasing sustainable food products. Food labels, sustainability seals, eco-labels, music and sounds of nature, etc., influence consumers to choose eco-friendly food products. In order to investigate the effects of food marketing including their labelling, packaging, pricing, etc., on consumers, eye-tracking studies have increasingly been used in agricultural and food research in recent years. So far, there is no review of eye-tracking studies that shows how customers can be persuaded to purchase sustainable food and what recommendations can be derived from that for the food industry. Therefore, the present work aims to provide an overview of previous studies that have examined sustainable food choices by consumers using eye-tracking studies, asking the following research question: what has been investigated in the last 15 years with the help of eye-tracking studies with regard to sustainable food choices and purchases of food made by consumers? For this purpose, the scientific literature from the last 15 years until today will be reviewed with the help of a systematic literature search. Corresponding recommendations for action will be given for food marketing research regarding eye-tracking studies as well as for the food industry in order to contribute to future sustainable food choices within this research area.

Valorisation of Banana Inflorescence for Natural Antioxidant and Polyphenol Production in a Circular and Sustainable Bioeconomy

sciforum-074054

Nuwanthi Mahamaya Senevirathna, [Azharul Karim](#), Ian O'Hara, Morteza Hassanpour

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The increasing global food demand has expanded the production of bananas (*Musa app.*) at a rate of 4.5% each year. Unfortunately, modern banana farming methods generate large amounts of waste that are often disposed of in landfills, leading to greenhouse gas emissions.

Banana inflorescence is a by-product generated on banana farms, which consists of bioactive compounds including phenolics with antioxidant, anticancer, anti-inflammatory, anti-cholesterol, antidiabetic, antimicrobial, antiproliferative, and cardioprotective therapeutic potential. However, research on the extraction, isolation and industrial applications of bioactive compounds from banana inflorescence has so far been minimal. In this study, low-cost, less time-consuming and energy-efficient pressurized liquid extraction techniques were employed for the extraction of bioactive compounds and micronutrients from banana inflorescence. This study evaluates the total phenolic content, antioxidant content and anthocyanin content of fresh banana inflorescence using GRAS (generally recognised as safe) solvent water at temperatures of 60 °C, 80°C and 100°C. The best results were found at 100°C with a 16.79 mg/g GAE total phenolic content, 48.45 mg/ml IC50 total antioxidants, and 0.36 mg/g total anthocyanins. Beneficial micronutrients such as Zn, Mn, Cu, Se and Fe were confirmed in water extracted from banana inflorescence.

The results indicate that banana inflorescence is a natural source of micronutrients, antioxidants and polyphenols, particularly anthocyanins, and could be used as a functional food ingredient or medicinal food to combat non-communicable diseases. The extract could be used as a food colourant, texture stabilizer, food emulsifier and natural antioxidant. The valorisation of banana inflorescence into innovative functional food products is not only financially viable but also socially and environmentally progressive. This emerging industry can contribute directly to achieving several of the United Nations' Sustainable Development Goals, including Zero Hunger, Good Health and Wellbeing, Poverty Eradication, Job Creation, and the Promotion of Industrialisation and Innovation (SDGs 2, 3, 1, 8, and 9, respectively).

Efficient and Sustainable Hybrid Drying for Reducing Food Waste: Developing a Physics-Based Model for Optimizing Heat and Mass Transfer

sciforum-074058

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Global food losses and waste, amounting to approximately 1.3 billion tonnes annually, pose significant challenges to food security and environmental sustainability. In Australia, the food processing industry faces considerable waste, about 5 million tonnes, particularly in fruits and vegetables, due to inadequate processing and preservation techniques. Drying is a widely used and cost-effective food preservation method. Traditional drying methods are energy-intensive and contribute to environmental degradation. Hybrid drying systems, such as the combination of convective drying with vacuum drying, microwave drying, and heat pump drying has emerged as a promising alternative for reducing waste and energy consumption.

However, the adoption of advanced drying processes is limited due to the lack of a modeling framework for selecting appropriate hybrid drying systems and the complexity of interconnected heat and mass transfer phenomena in these systems. This study investigates a hybrid drying method, namely, intermittent microwave-convective drying (IMCD) on Granny Smith apples, both theoretically and experimentally. First, a fundamental physics-based model was developed to optimize heat and mass transfer for IMCD, and the model results were compared with experimental data. The findings suggest that intermittent microwave-convective drying is an efficient drying method as it significantly reduces drying time and energy consumption. However, if temperature and humidity levels are not effectively managed, thermal runaway can arise. This study emphasizes the pivotal role of humidity control in optimizing drying performance.

The results of our study support the advancement and wider implementation of sustainable and energy-efficient drying methods, representing a significant stride towards adopting more environmentally friendly practices in food processing sector.

Development of Ceramic Coating Formula Using Design of Experiments and Mixture Design Technique: Sludge from Water Treatment Process

sciforum-073714

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This research investigates the potential use of waste materials from water usage production in ceramic coating, with the aim of promoting circular economy practices and reducing industrial waste. Using the Design of Experiment (DOE) technique with a Mixture Design approach, nine experimental formulas were tested with the proportion of flux and silica adjusted between 40 and 70% and 10 and 30%, respectively, while maintaining a constant temperature and firing atmosphere.

The research findings indicate that a formula consisting of 60% flux (soda feldspar) and 10% silica, categorized as a high-fire glaze, was the most suitable for ceramic coating. The research demonstrates the importance of selecting appropriate mineral components for the mixture design to achieve desired results and create added value in ceramic coating.

Overall, this research highlights the potential value of utilizing waste materials as a resource in promoting circular economy practices and provides valuable insights for future research in this field. The use of DOE with a Mixture Design approach was effective in finding a suitable formula for the ceramic coating experiment.

Embrace Change, Encourage Creativity: Orchestrating Sustainable Transitions

sciforum-080312

Ladeja Godina Košir – Keynote Talk

*Founder & Executive director Circular Change
Co-Chair ECESP*

In the pursuit of a sustainable future, the imperative for change is undeniable. The presentation "Embrace Change, Encourage Creativity" delves into the intricate relationship between sustainability and transition, unveiling the profound symbiosis between staying in enduring vitality and evolving towards novel paradigms. The reluctance to embrace change is a deeply rooted aspect of human nature, yet this resistance often hinders the latent power of transformative processes.

This discourse contends that the recognition of the necessity for transformation should transcend the realm of persuasion. Instead, it directs attention towards the orchestration of systemic change, where the societal dimension emerges as pivotal. Circular diplomacy can play a significant role. The architecture of the economy invariably mirrors the societal structure and values; thus, profound transformation shall be based on the rethinking of our core values and needs.

Crucially, humanity is an integral part of the nature. Aligning mindset and decision-making with this intrinsic harmony becomes paramount. The discourse advocates for a harmonious relationship with nature, rooted in a respect of planetary boundaries. Dematerialization, novel production-consumption patterns, intergenerational dialogue, and radical collaboration emerge as the compass for preserving human existence and averting extinction.

Central to this journey is creativity—a potent force that can navigate the trajectory of positive transformation. By fostering imagination and innovative thought, by transcending conventional boundaries, creativity becomes the catalyst for envisioning and realizing sustainable pathways and sustainable lifestyle. Based on choice, not on the dictatorship. The presentation underscores that humanity's resilience and capacity for adaptation can be harnessed through creative thinking and network governance.

In conclusion, "Embrace Change, Encourage Creativity" argues that the sustainability-transition nexus is pivotal for a viable future. It champions transcending resistance and architecting systemic change. As society transforms, alignment with the planet's ecological polyphony becomes essential. This transformative journey, guided by creativity, is not an option but a lifeline to prosperity and endurance.

Meeting Shareholders and Stakeholder Expectations on Corporate Sustainability – Industry Experts Talk

sciforum-073351

Joachim von Heimburg¹, Marc Dreyer²

¹ *Founder & Managing Director, jvhinnovation GmbH*

² *Managing Director, Futopedia Consulting*

While sustainability is prominent on the agenda of many organizations, progress achieved globally to date is far from satisfactory. Most companies are aware of the expectations by consumers and customers to address the needs of the planet and society and of the related long-term business risks for not doing so. However, they are struggling to address the unavoidable trade-offs to meet these expectations because they are rewarded by most investors to deliver maximal shareholder value in the shorter term.

The concept of responsible innovation is aiming to address these trade-offs by focusing on long-term value for stakeholders and shareholders, likewise. Solutions emerging will require companies to rethink and amend their innovation processes, both in technologies and business models and resources for scaling-up such innovations.

To develop guidance for Innovation Managers, the Task Force on Responsible Innovation of the European Industrial Research Management Association (EIRMA) conducted, in 2022, a series of focus groups and panel discussions with innovation practitioners. We sought their views and learnings, specifically analyzing dimensions of value creation, the role of companies and their purpose, and the double materiality issues in innovation processes and programs. We identified key drivers for innovating responsibly, such as addressing ambiguities in value perception; broad enough common understanding of the role of a company and its fiduciary duty; and ambiguities of identifying the double materiality stemming from their innovation strategy. As a prerequisite, companies need to take a longer-term view on risk management and opportunities for growth. Learnings from Sustainable Finance have provided additional insights here.

While by design qualitative, it provides to Innovation Managers a framework for innovating responsibly that reflects the front-line experience of practitioners. Thus, it can support them in their quest to innovate not only for the benefit of shareholders, but also for stakeholders and society in general.

Emission Quantification for Sustainable Heavy-Duty Transportation

sciforum-073454

Norbert Biro, Daniel Szollosi

Hungarian University of Agriculture and Life Sciences

Corporate fleet managers are struggling with setting out sustainable, cost-effective, and future-proof plans for transportation means. There is no universal answer to reaching the lowest possible emissions in terms of transportation; therefore, a deterministic emission quantification method is necessary to make scientifically supported decisions. In this study, a well-to-wheel (WTW) methodology is introduced for comparing various propulsion systems—electric, hydrogen fuel cell and internal combustion (ICE, BEV, FCEV)—in combination to fuel production pathways. This also allows the inclusion of specific expended energy in relation to greenhouse gases (GHG) emitted during the fuel production process and its integration with vehicle emissions. The ICE part of the analysis is carried out in an engine test bench laboratory. The energy consumption and GHG emissions are measured, not estimated, providing a comparison that is closer to real life. The final results suggest, even with the EU's fair fossil energy carrier-dependent energy mix, the usage of electric propulsion systems can reach a GHG emission reduction of up to 56% compared to conventional ICE.

Quality of ESD: From Irrelevance to Impact

sciforum-074091

Carina Hopper, Johanna Wagner

ESSEC Business School

The present paper aims to evaluate the quality of education for sustainability (ESD) and its impact, in order to prevent inadequate and even detrimental ESD implementation by higher education (HE) institutions. After a literature review, the authors propose a formative and personalized quality assessment at every stage of ESD implementation to ensure a positive impact. The paper explores the concept of quality in (sustainability) education and the role of accreditation and rankings in quality improvement. It also analyzes the different types of ESD and provides a reflection on student feedback as an essential component of quality assessment. The authors bring awareness to the student voice regarding quality in sustainability education. The research is based on student and faculty perceptions, as well as the observations of the authors as HE lecturers and cofounders of Join EDuC. The paper answers the question “what is quality sustainability education?” and argues that it is worth asking about the dangers of inadequate sustainability education. The authors also suggest risk mapping to help researchers better understand each risk and the potential causes, to be developed in future research. Overall, the paper highlights the importance of quality assessment in ESD and its impact on sustainability and wellbeing for all.

Corporate Sustainability Data: A Tale of Surfing the Regulatory Tsunami

sciforum-074263

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³ *msg global*

Corporate sustainability reporting has become an essential tool for companies to communicate their environmental, social, and governance (ESG) performance to stakeholders. In the EU, companies have been required since 2013 to report on their sustainability performance under the Non-Financial Reporting Directive, and since 2023, under the new, and more demanding, Corporate Sustainability Reporting Directive. As companies collect and report more sustainability data, the importance of data and data processing in sustainability reporting is becoming increasingly important. In this academic article, we discuss the importance of data and data processing in corporate sustainability reporting from the perspective of msg global, a leading provider of ESG data management solutions with extensive experience in data gathering, managing, and processing. We argue that high-quality sustainability data are essential for effective sustainability reporting, and that data processing technologies can help companies overcome the challenges of managing large and complex sustainability datasets.

Msg global has worked with numerous companies in various industries, helping them to collect, manage, and analyze their sustainability data. Through this experience, we have identified several challenges that companies face when managing sustainability data. These include the lack of standardization in sustainability reporting, data quality issues, the sheer volume of data that needs to be processed, and the lack of use of this data for further use beyond reporting, which are all discussed in the proposed article. To address these challenges, msg global has developed a suite of data management solutions that leverage data processing technologies. These technologies help companies improve the accuracy and reliability of their sustainability data, identify trends and patterns in their data, and make more informed decisions about their sustainability performance. Data processing technologies can help companies communicate their sustainability performance more effectively to stakeholders by presenting data in a more accessible and engaging way.

“Sustainable Diets” as an Interdisciplinary Elective Course for International Master’s Degree Students Raising Awareness About Human Diet–Environment–Health Interlinkages

sciforum-074083

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University of Kassel

The human diet is in the spotlight of the sustainability debate, being increasingly acknowledged as one of the leverage points to transform the food system and help humanity to stay within the safe operating space. An elective food module “sustainable diets” offered at Faculty of Organic Agricultural Sciences of University of Kassel (Germany) aims at attempting to realize this potential held by human nutrition through educating international M.Sc. students about the two-way interactions between the environment and human diet. The course relies on the food systems approach and the environment–human health nexus, while evaluating the environmental, social, and economic impacts at every step of the food system and using dishes as a single unit of analysis. Every session is accompanied by group work and/or individual tasks to deepen the understanding of a given topic, develop critical thinking vis-à-vis the various food sustainability aspects, and familiarize students with a variety of cultural aspects regarding diets. As part of the final examination, students (in groups) develop and cook a new or reformulate an existing recipe of a main course, which should be aligned with the criteria of the Planetary Health Diet (PHD). As a second part of examination, students (individually) prepare weekly nutrition diaries, where details on their weekly grocery shopping, purchased foods, meals prepared, and waste generated over one week are being recorded and reflected on using the seven principles of sustainable nutrition according to von Koerber et al. (2017). Based on the students’ reflection in both assignments, it can be observed that ESD in international degree programs does hold potential to trigger positive dietary behavior changes, based on the increased awareness and consciousness about one’s own nutrition and the impacts it has.

Basel Hub Abstracts

Poster Exhibition

Can Environmental Concerns Prompt a Reduction in Meat Consumption Among Polish Parents?

sciforum-074673

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Being caring for the planet and open to changing the way we eat, especially limiting the consumption of animal products, are two important attitudes necessary for a nutritional transformation towards a more sustainable diet. These two concepts are closely linked, as consumer dietary choices have a significant impact on the environment.

This study aimed to find out whether young parents, who are influential in creating the eating habits of the new generation, feel responsible for the state of the natural environment and whether they are willing to consider switching to a more plant-based diet. An online survey was conducted among residents of Polish cities aged 18–40 years in May 2023. Data from a sample of 448 adults with children were analysed using cluster and descriptive analysis and the SPSS programme.

The results show that about a third (33.2%) of the sample prioritised environmental issues (Cluster 2), whereas for those in Cluster 1 (23.2% of the sample) and Cluster 3 (43.6% of the sample), personal well-being or current needs were more important than long-term environmental sustainability. Being active and interested in the state of the planet was positively correlated with an openness to reducing meat consumption and switching to a more plant-based diet.

The study indicates that individual concerns for the state of the environment can play a crucial role in changing consumption towards sustainable food consumption patterns. Therefore, increasing knowledge on and awareness of the impact of individual behaviour and food choices on the natural environment can inspire and promote sustainable behaviour.

Evaluating the Sustainability: Evidence from Panel Data Analysis of G20 Nations with Cross-Sectional Dependence

sciforum-074315

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The nation has been keen to adopt and make vital efforts to replace fossil fuels with alternative energy since the Kyoto Protocol held in 1997 and the Paris Agreement in 2016. This paper aims to study the dynamic relationship between the G20 nations in their performance in the field of trade and non-conventional energy usage through data from 1990 to 2020. The G20 nations, as the name suggests, consists of 19 nations and 1 economic union, which is the European Union. With the non-availability of data for various indicators, the European Union dropped from the study. The study is being conducted on only the 19 G20 countries. This study considers the cross-sectional dependence property of the number of cross-sections used. Thus, the study uses Panel-corrected Standard Errors (PCSE) and Feasible Generalized Least Squares (FGLS) estimators to deal with the problem of heteroskedasticity and cross-sectional dependency phenomena. This study investigates the effect of renewable energy usage on the trade performance of the G20 nations. The study shows that with the increase in renewable energy sources, there is an increase in trade. Thus, the use of renewable energy encourages trade and a shift from conventional sources of energy to non-conventional sources is required as the need of current times.

Exploring the Impact of ESG on Financial Performance: The Moderating Role of Digital Transformation

sciforum-074329

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In recent years, environmental, social, and governance (ESG) is an important investment concept in the financial market and becomes the enterprise action guide. It is also the concrete reflection of sustainable development in the financial market and micro enterprise level. To find out whether and how ESG impacts financial performance, we use A-share listed companies in China from 2015 to 2021 as samples to test this mechanism. By using the ordinary least-square estimation, we find that ESG positively and significantly affects a firm's financial performance and the promoting effect is driven by digital transformation. We further find that the positive effect of current ESG on financial performance in the lag period is gradually weakened. In addition, the heterogeneity test results show that the enhancement effect is significant for non-state-owned companies but insignificant for state-owned companies, and the same is true in companies located in the east area. Last, the enhancement effect of ESG on financial performance for polluted firms is stronger than that for non-polluted firms. The above findings would be useful both to the following researchers and the interested parties.

Framework for Seaport Sustainable Operations Management for Major Seaports in India and Its Contribution to the United Nation's Sustainable Development Goals

sciforum-074459

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Seaports are multifaceted transport nodes in the international transportation network and the seaports sector is referred to as one of the most polluting industries across the globe due to their complex process and operations. The lack of implementation of sustainability-related seaport growth policies is a problem in the maritime sector in many developing countries like India. The primary purpose of this research paper is to identify and investigate the three dimensions of environmental, social, and economic dimensions of seaport sustainability operations for major seaports in India. The key research objective of this study is to find the level, behavior, and contribution of 11 SDGs that are most appropriate for major seaports in India out of 17 UN SDGs. Seaport sustainability practices that correspond with SDGs across the globe were identified through an extensive literature review. In total, 10 focus interviews were carried out with port managers in India to identify the existing knowledge about seaport sustainability. A conceptual model framework has been developed for UN SDGs which is specified for sustainability of major seaports in India. A questionnaire was developed and data were gathered from all-level major seaports employees of India (n=153) and were analyzed using exploratory factor analysis (EFA) and thematic analysis. The results of the study indicate the alignment of the UN SDGs related to major seaports in India for core SDGs and secondary SDGs. The paper also provides maritime policy implications for the maritime-associated sector and sustainability-related design in major seaports in India. This research also identifies the barriers which need to be addressed in seaport operational and management-related systems to incorporate the best practices towards alignment towards SDGs in major Indian seaports.

Quantitative and Qualitative Analysis of Sustainability Reporting in Spain-Based Mining Companies

sciforum-073550

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As Corporate Social Responsibility (CSR) has gained significant attention in the mining industry as a means for achieving sustainability in recent decades, companies have been motivated to publish their reports aligned with the benefits of their stakeholders: society and the environment. Spain has made significant efforts to encourage Corporate Social Responsibility (CSR) in its mining industry. The government has introduced various policies and regulations to ensure that mining companies in the country operate in an ethical and sustainable manner. Spanish mining companies have also demonstrated a strong commitment to CSR by implementing initiatives that benefit local communities and support sustainable development. However, there are still challenges in the industry, particularly concerning labor rights and ethical practices in supply chains. Despite these challenges, Spain's dedication to CSR reporting in the mining industry shows its commitment to responsible business practices and sustainability. There is no research analyzing sustainability reports in the mining industry. This study will analyze CSR reporting as a proxy of the sustainability commitment of some of the most significant mining companies based in Spain over a five-year period. The CSR reporting of the companies will be analyzed through their annual reports. The content analysis is set to be employed to extract necessary information from the sustainability section of top Spain-based mining companies' annual reports regarding main CSR themes including community development initiatives, environmental sustainability efforts, health and safety, human rights, and ethics, after which the data will be analyzed through quantitative methods. The results will reveal the proportion of dedication for each category by the companies, which evaluates the strengths and weaknesses of CSR reporting in the mining industry, and as a result, can be a starting point for further research and more accurate decision-making at the management level.

Gender inequality in Hollywood: Uncovering the structures of the industry behind the camera

sciforum-074120

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The film industry faces massive inequality between women and men (Karniouchina et al. 2023, Valentowitsch 2022). This is particularly evident in the representation of both genders on screen (Kagan et al. 2020, Lauzen 2018). For instance, women are less likely to play the lead role, receive less dialogue time, and are more likely to take only decorative acting roles in films (Neville and Anastasio 2019, O'Meara 2017, Agarwal et al. 2015). However, this superficial imbalance masks a structural inequality in the film industry that has been less explored (Simon 2019, Smith et al. 2017, Lindner et al. 2015). Although the creative skills of women and men do not differ significantly and both genders are equally capable of taking on creative roles as directors, screenwriters, editors, or composers in film production (Stolzfus et al. 2011, Matud and Grande 2007, Kaufman et al. 2004), women remain significantly underrepresented in these professions (Wolfe 2019, Chattoo 2018, Abraham 2016). This striking imbalance persists even after accounting for the different life circumstances of male and female creative professionals and the differences in societal roles and expectations for men and women that manifest, for example, in different levels of engagement in childcare (Berridge 2022, Miller 2016). With this in mind, the present study addresses the problem of imbalance by tracing the structures in the film industry and asking why gender inequality exists. In doing so, the study finds that women directors receive significantly less funding for their film projects than their male counterparts and are thus structurally disadvantaged. Moreover, women play only a subordinate role in the relationship structures of the industry, suggesting that they are excluded from male power networks. Future research could build on these findings to further examine the social networks and power structures in the film industry and shed light on the micro-level explanations for the imbalance problem.

An Analysis of Agricultural Education Curriculum in Two Higher Education Institutions in Northern Ghana: Its Agility in Responding to Climate Change

sciforum-074069

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Climate change significantly threatens agricultural production, particularly in developing countries, such as Ghana, where agriculture plays a key role. Climate change poses a threat to the agricultural industry. Agricultural education curricula play a vital role in mitigating the impact of climate change by equipping graduates with competencies to adapt to climate change. The study analyzed the curriculum of two higher agricultural education institutions in northern Ghana for its agility in responding to climate change.

The study employed a qualitative research design and collected data through document analysis and interviews. The study found that both institutions have not adequately integrated climate change into their agricultural education curriculum to varying degrees. Also, the curriculum did not address aspects of agriculture, such as gender, energy conservation, and indigenous practices. The study highlights the absence of a strategy for integrating climate change into the curriculum.

The study recommends that the institutions review their curriculum and ensure it is responsive to emerging climate change challenges, including incorporating sustainable farming courses and providing faculty members with the necessary training and resources to teach climate change effectively.

This study highlights the need for agricultural education curricula to be agile and responsive to climate change challenges. Failure to do so can result in graduates' incompetence in dealing with the impact of climate change on agricultural production, which can have dire consequences for food security and the economy. The findings is relevant to policymakers and academic institutions, highlighting the need to review their agricultural education curriculum and ensure that it is responsive to emerging climate change challenges.

Proposing a Holistic and Transformative Approach for the Promotion of SDGs in Higher Education Institutions

sciforum-074090

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The current paper presents an innovative approach aiming to enhance sustainability in higher education institutions via transformative and integrative ways of engaging in the SDGs at all levels within the academia, social life, and operations. The presented framework sees universities as Hubs that receive and transmit input from and to the society. The current paper uses the Erasmus + project SDG4U as a paradigm of change through which a concrete methodology on the SDG-related education is promoted.

Emphasis is placed on stimulating innovative learning and teaching practices through engaging SDGs to transformative education and sustainability practices in universities. It supports and enhances the implementation of SDGs in higher education by embedding sustainability across teaching, research, operations, and community outreach. While the focus is on SDG 4—Quality Education horizontally, all SDGs are equally addressed, in such a way as to expand research and academic offerings to include indicators and processes for a holistic sustainability forward looking teaching.

The work is aligned with Goal 4.7 on 'education for sustainable development and global citizenship', and 4.a on enabling 'effective learning environments'. It is accordingly framed to: a. Assess and report the progress towards the implementation of SDGs and of sustainability approaches; b. Improve academic offerings, enhance curricula, integrate sustainability concepts in teaching towards transformative learning experiences, as well as invest on sustainability-related research; c. Actively engage on processes and initiatives at university level, with high outreach to the society supported by wide dissemination activities; d. Facilitate interventions and advancement of operations following sustainability and green practices.

The foreseen activities enable access to knowledge and skills required for understanding and promoting sustainable development, through formal education, life-long learning programs and initiatives with emphasis on promoting equality, on developing a culture of peace, non-violence, inclusiveness, and fairness at all levels.

Integrating STEM and SHAPE in Higher Education: An Integrated Public Policy Taxonomy for Sustainable Development

sciforum-074641

Mukul Saxena

Alliance University

The paper proposes an Integrated Public Policy Taxonomy (IPPT) for higher education by integrating STEM and SHAPE. The British Academy defines SHAPE as Social Sciences, Humanities, Arts for People, and the Economy/Environment. The paper argues that Bloom's taxonomy of learning objectives and Fink's taxonomy of significant learning are inadequate to expose students to the multidimensional challenges of inclusive and sustainable policy-making. The IPPT creates mutually reinforcing process within the structural and substantive design of policy-making. Structural processes focus on sustainability by alleviating poverty. It integrates the assessment of necessity, evidence-based analysis using data and sciences, resources management, economic policies, and the target population. Substantive design focuses on inclusivity by mitigating the risk of exclusion and marginalization. It integrates social and cultural norms, participation and decision making through the human rights approach, behavioural adaptation and social acceptability. The IPPT consists of six stages of learning which includes diagnosis, context, feasibility, design, implementation, and monitoring and evaluation. Diagnosis refers to the identification and assessment of the overall policy environment focusing on the provisional, substantive, analytical dimension of policy-making. The context refers to the social and cultural norms, the socio-economic factors, the risk of inequality and exclusion, intersectional vulnerabilities, and just and equitable impact through a human rights-based approach. Feasibility puts the policy within the realm of realism, assessing political ideology and social acceptability. Design refers to the scope, complexity, and scalability. The monitoring and evaluation is a continuous process which assesses sustainability and inclusivity as a benchmark of success and acceptability. The proof of concept was validated during a three day public policy simulation for post-graduate public policy students in Hyderabad, India. The simulation was part of the course, "Strategizing Inclusive Public Policy Interventions" which defined the overall learning environment to test the IPPT.

Sustainability Literacy in Higher Education Institutions: A Social Network Strategy at Tamaulipas, Mexico

sciforum-073782

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Today's world faces significant challenges such as poverty, hunger, climate change, as well as an extended social gap; according to UNESCO, it is time for Higher Education institutions to reconsider their role and mission as agents of change in a fast, urgent, and fair way toward sustainability. Though, what knowledge do Tamaulipas University students currently have about sustainable development? Are social networks a feasible mechanism to reach them?

This research project aims to evaluate the impact that exposure to sustainability issues in social networks has on the level of knowledge of sustainability of university students. To achieve this, the international evaluation SULITEST used throughout the world was employed to comprehend the level of sustainability literacy in higher education institutions in the state of Tamaulipas Mexico. Evaluating a representative group of students before and after the periodical publication on social networks of varied sustainability topics. The result obtained indicates that the variation in the level of sustainability literacy is minimal, evidencing a more promising impact on those individuals with previous interest in the matter. It also revealed the necessity to generate suitable strategies to improve the level of knowledge of the participants.

Racialized Diasporas in Taylor-Massey, Toronto: Sustainability-Programming Impacts on Neighbourhood Improvement Areas

sciforum-073223

Zeina Seaifan

University of Toronto School of the Environment

Taylor-Massey, Toronto, is a largely racialized immigrant neighbourhood that is designated as a Neighbourhood Improvement Area by the City of Toronto. This indicates there are social inequities present in Taylor-Massey. This research asks how diasporic communities in Taylor-Massey are accessing, understanding, and taking up sustainability-related programming through community organizations such as Access Alliance Multicultural Health and Community Services. In connection to this central question, four related sub-questions will be explored: (1) How are Access Alliance sustainability-related practices adopted by racialized diasporic communities in Taylor-Massey? (2) What role do the cultural backgrounds of diasporic individuals have in understandings of sustainable practices? (3) How do barriers, both internal (e.g., different beliefs and values) and external (e.g., restrictive residential regulations and underdeveloped transportation infrastructures), impede the efforts of Access Alliance? (4) What are the possible interventions that community members are aspiring for in achieving sustainable practices? Interviews and participant observations guided by a qualitative approach will be used to explore this research question. This project will contribute insights into how culture, mediated through diasporic communities, plays a role in our understanding of sustainable living. Anticipated findings include examining what Taylor-Massey residents are aspiring for in achieving sustainable practices by looking into prominent internal and external barriers. Ultimately, these findings will advance and contribute to existing understandings of the intersection between sustainability and diaspora studies. Moreover, this study's analysis will be relevant for contextualizing systemic inequities in similar Neighbourhood Improvement Areas in the Greater Toronto Area (GTA).

Green Roof Detection Through Satellite Imagery Using Faster R-CNN

sciforum-074048

Luzalen Marcos, Kristiina Valter Mai

Toronto Metropolitan University

Toronto Metropolitan Resilience Engineering Lab

With the threat of global warming, there is a need to implement sustainable solutions. Due to urbanization, forests and other natural resources that could have helped reduce carbon emissions are being depleted. Thus, cities such as Toronto experience urban heat island effects, food shortages and increased carbon emissions. To help solve this, the implementation of green roofs is encouraged in Toronto to improve building insulation, add a plant canopy to clean and cool ambient air, and even to produce local food. Through better stormwater management, they can address the food–energy–water nexus. However, some green roofs are not readily accessible, and most are not public access. In addition, green roofs are difficult to maintain, for reasons such as safety and weather, and it is inconvenient for building managers or urban farmers to physically go and check the green roofs. City planners can benefit from monitoring green roofs in the city. Hence, this study proposes the use of deep learning for the detection of green roofs from satellite imagery. The approach uses NDVI values and Toronto Building data to obtain green roof locations. Satellite images were taken from map services such as Google Earth Pro and ArcGIS Pro. The images were preprocessed and fed into the Faster Recurrent Convolutional Neural Networks (R-CNN) model to detect green roofs. Since this is the first step in creating a system that can monitor the green roof food–energy–water nexus, in the future, the behaviour of Faster R-CNN with Toronto roof satellite images was observed. It was shown that the Faster R-CNN provided a higher validation accuracy and higher confidence score than the Fast R-CNN. It is suggested that the current Faster R-CNN model needs to be improved to precisely detect green roofs in different image resolutions and dimensions.

The Places That Feed Us: Food System Governance Along the Urban–Rural Continuum

sciforum-073979

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State University of New York at Albany

The urgency of a pandemic paired with a mandate to address the state of historically underserved rural communities suggests that we must begin the process of designing regional food systems that are durable, inclusive, diverse, and sustainable. After decades of tepid progress, we are now compelled to do this quickly, and as accurately as possible, in order to safely navigate an uncertain future. This overview of a set of connected projects details the ways in which government funding across regions has impacted the ability of rural regions to thrive and prosper.

First, I offer the results of an interview and survey project with local municipal officials across New York State, investigating their ability to address local food systems challenges. I found that access to local food varies, but food insecurity is considered a low-priority problem in most places. Local food systems projects also tend to be a low priority; however, as many food systems projects do not require a lot of capacity or funding, they tend to be well-dispersed across New York towns. I also find that collaboration, as a function of leadership, local capacity and established collaboration mechanisms, is predictive of town effectiveness.

In this climate, entrepreneurship is also crucial: it is vitally important that systems and structures are designed to effectively support start-ups and nurture them into mature firms. As part of this suite of projects, we are also investigating the effectiveness of New York State's regional economic development model as a mechanism for supporting rural communities, entrepreneurs and local food systems. I offer preliminary results from a mixed method data collection effort including content analysis, topic modeling and simulation, paired with a case study of New York State's Capital District region evaluating the impact of COVID on food and agriculture in the region.

Social Inequalities of Spaces for Aging Populations

sciforum-071065

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Université de Montreal

There is a persisting gap between what is expected in design and what is actually developed in urban built environments. This gap explains why some levels of quality appear less than acceptable for some conditions and vulnerable populations. In itself, the question of quality addresses the many blind spots in the process of planning, design, development, and built outcomes. Among these blind spots are built environments that lack the consideration of older residents. The population aged 85 and older in Canada is one of the fastest-growing age groups, with a 12% increase from 2016. Currently, 2.3% of the population is aged 85 and older (Government of Canada, 2022). By placing aging populations as a resource where their knowledge is intrinsic to the process, our team has aimed to develop a forum upon which they can intervene directly in questions of quality, accessibility, and equity in the built environment. There are important alignments and tensions between municipalities' addressal of smart and sustainable cities and the spaces for aging populations. Even if municipalities have developed extensive strategies for climate change on the one hand, and age-friendly strategies on the other, these are rarely aligned. How do these siloed strategies come together in the design and development of the built environment? We present a series of urban scale maps that show some of the social inequalities of spaces for aging with regard to access to green spaces, health services, social urban spaces, etc. We also present some in-depth case studies of elderly residences that point to a further lack of consideration for the quality of the built environment for the elderly. We end with a reflection on: how can collective social consciousness change what quality is in the built environment?

Seismic Performance of Retrofitted RC Frame Structure After Column Removal and Retrofitted by Post-tensioning Tendons and RC Jacketing

sciforum-074550

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Building retrofitting is an economical option for extending the usable space of existing reinforced-frame structures. Removing a column and reinforcing the adjoining beams and columns is necessary to achieve this end. In the seismic area, the retrofitted building is required to withstand the gravity forces and resist the horizontal forces or earthquake action. Therefore, this study investigates the seismic performance of a 2-bay, 2-story reinforced concrete (RC) framed structure and an alternative RC frame after column removal and retrofitted by post-tensioning tendons based on experimental and numerical simulations. After removing a column from the ground story, the beam above the removed column and the adjacent columns was strengthened with a layer of RC jacketing and additional post-tensioned tendons. The results from the cyclic test demonstrate that the retrofitted RC frame exhibits high lateral stiffness, shear force, and smaller shear deformation than the existing RC frame, but the ductility and energy dissipation was approximately the same. Furthermore, the retrofitted RC frame failure occurred in the second-story beam-column joint, but the existing frame failure was in the ground-floor beam-column joints. Additionally, a numerical macro-based finite element model of the specimens was developed in OpenSEES, verified with experimental data, and utilized for parametric study. According to the numerical findings, this upgrade is appropriate only when the axial compression ratio of the second story's side columns is less than 0.5. Due to this restoration, a planar, two-bay, two-story structure will likely get a softer upper floor. Therefore, it is essential to regulate the sizes of reinforced columns, and it is recommended that the elastic lateral stiffness ratio of the renovated story (i.e., with more space) should be greater than 0.5 compared to the upper story.

Challenges Towards Green Cities Development in Developing Countries: An Example from Kathmandu, Nepal

sciforum-074626

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Unplanned urbanization and demographic and environmental changes have forced many cities into uncertainty and risk, challenging economic, social, and environmental sustainability. The Kathmandu metropolitan city is one of the fastest-growing capital cities with recent and frequent evidence of unplanned development, loss of green space, tragic events of an earthquake, flood, and other environmental problems causing devastation, economic damages, and loss of human life/health, and habitats. The aim of this study is to examine the barriers to green cities development in developing countries. To explore the challenges to the development of environmentally friendly cities, a thorough literature review was conducted. The research employed a quantitative research strategy; secondary data from professionals and varied governmental and stakeholders were taken. The barriers to green city development identified were lack of awareness of the benefits of a green city, environmental degradation, insufficient policy implementation efforts on construction, excessive generation of solid waste and its management, unmanaged urbanization, and internal migration. The study's findings reveal that human occupancy is prevalent across all areas, and the per capita availability of open green space in the city is significantly below the global average. By adopting such modalities, the local government can work towards increasing the availability of green spaces within the city, thereby improving the quality of life for its residents and promoting sustainable urban development. The study's results offer valuable insights to stakeholders involved in city development, shedding light on the barriers that hinder the progress of green cities. Additionally, the study suggests a practical solution by emphasizing the inclusion of green city concepts in the education and training of stakeholders, aiming to enhance awareness and understanding in this area. This proposal can contribute to addressing the identified barriers and fostering the development of sustainable and environmentally friendly cities.

Rethinking Human-Centric Architecture: Universal Design Principles in Compact Residential Spaces

sciforum-073787

Elena Gyulay, Brian Robert Sinclair

University of Calgary

As 'small-scale housing' concepts gain popularity worldwide, including in Canada, (Shearer and Burton, 2019) due to environmental benefits (Saxton, 2019) and urban densification potential (Nelson and Schneider, 2018), it is essential to understand effects on human psychology, culture, and society writ large. Given current global demographic factors, such as rapidly aging populations (Tauke, 2017), this research is concerned with whether small-scale houses have the potential for being universally designed, therefore alleviating existing accessible housing crises in Canada (i.e., instead of weighing them down). Despite growing acknowledgments of older adults as positive contributors to society, their social integration has not yet been achieved in contemporary civilization. Today's housing, for example, proves a barrier to independent living for older adults because vital elements, such as steps into a house, might prevent people from participating in life with equity (Tse, 2001). Life becomes less meaningful or less fulfilling when participation becomes difficult. The concept of universal design, which aims to accommodate the vast majority of the world, is used in this study as a principal criterion in post-occupancy evaluation of usability, flexibility, and adaptability, as well as the evaluation of psychological well-being and social inclusion of occupants. This study, pilot in extent, explores whether post-occupancy evaluation of universal design, as a specific evaluation method, could successfully integrate universal design knowledge into small-scale building design practices. Such integration would allow designers, architects, and policymakers to go beyond the current sustainability agenda of small-scale houses by recognizing complex interactions and synergies between various aspects in the built environment. Additionally, bundling universal design paradigms with emergent typologies (i.e., small-scale houses), holds promise to pave ways for innovative solutions for spaces reduced in size, thereby improving the balance between efficiency, desirability, and quality of both environments and lives.

Simulation and Analysis of a Hydrogen-Powered System for Zero-Energy Buildings Using TRNSYS Software

sciforum-074603

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The detrimental impacts of global warming and environmental pollution have raised concerns about the well-being of life on Earth. Consequently, there has been increasing interest in large-scale zero-energy buildings that harness clean energy resources. Among the sustainable fuels available, hydrogen stands out for its high efficiency, greater energy content compared to diesel and gasoline, and zero emissions. In net zero energy buildings, hydrogen can be effectively integrated into hybrid renewable energy systems as a reliable, long-term energy storage solution, surpassing the limited storage capabilities of batteries. This study focuses on determining the optimal design for a hydrogen storage system to enable a small lab building in Toronto, Canada, to operate independently from grid power by fulfilling its hourly energy needs through renewable resources. To achieve this, a comprehensive model utilizing TRNSYS software was developed to analyze the behavior of an energy system capable of supplying electricity to the lab building. Climate data specific to Toronto were extracted using TRNSYS for one year to conduct the case study. The system comprises solar panels, an electrolyzer, a fuel cell, and a hydrogen storage tank. The findings of this study highlight the potential of hydrogen storage systems to enhance the reliability of renewable energy systems throughout the year, consequently reducing dependence on the grid. The optimized simulation results demonstrate that the lab building's energy demands can be met for an entire year using solar panel electricity production and the hydrogen storage unit, with minimum required grid power. Furthermore, the study provides insights into the behavior of the electrolyzer power, fuel cell power, and hydrogen tank level throughout the year, offering valuable information on their performance and dynamics.

The Impact of Glazing as a Form of Building Envelope on Carbon Emissions in Toronto

sciforum-072831

Ruba Salah

Toronto Metropolitan University

In light of the decarbonization targets for Toronto City to mitigate Climate Change and Carbon Emissions by 2030, 2040, and 2050, this study aims to develop an understanding of the real impact of glazing used in buildings' facades on carbon emissions by assessing the whole life carbon (WLC) of a high-rise office building as a case study in downtown Toronto. The objective is to answer the main research question, "What is the impact of different glazing systems as a form of the building envelope on total carbon emissions of a high-rise office building in Toronto?"

Four types of glazing systems were assessed in One Click LCA for comparing the Embodied Carbon (EC) across multiple scenarios of Window-to-Wall Ratio (WWR) for the office building. They were also modelled in OpenStudio/ EnergyPlus for simulating the annual operational energy use and calculating the Operational Carbon (OC) accordingly. The Whole Life Carbon (WLC) of the embodied and operational carbon combined was analyzed in relation to the glazing systems type, WWR, and the thermal transmittance (U-factor) of each system.

The results highlighted that embodied and operational carbon are directly related to the U-factor and WWR for different glazing systems considered. In general, as the WWR or the U-factor reduced, so did the WLC; a reduction ranging from 16% to 40% was addressed from the base case with the highest WLC (47.3 kgCO₂e/m²/yr) to the lowest WLC (28.41 kgCO₂e/m²/yr), due to the 42% reduction in the Energy Use Intensity (EUI) from (359 kWh/m²) to (207 kWh/m²) by reducing the amount of glazing to 25% and changing the glazing system to a lower U-factor. However, more reductions between 9.4% and 10.8% of WLC could be achieved if the electricity carbon factor gradually decreased in the next 30 years based on the assumption of clean electricity afterward.

A Route to Net Carbon Zero: The Case Study of Social Integration in Sultanpur Wetland, India

sciforum-073769

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Wetlands are natural habitats that provide an ideal environment for the long-term storage of atmospheric carbon dioxide (CO₂) when left undisturbed. However, urbanization has resulted in the loss of wetlands, which not only reduces their capacity for carbon storage but also contributes to the release of methane and other greenhouse gases due to ground disturbance. Despite these challenges, there is growing interest in using urban wetlands to mitigate the effects of global warming, particularly for water management. This research examines how urban wetlands could contribute to urban net-zero objectives, both in terms of their carbon sequestration capacity and as part of broader sustainability programs, using a case study of a prospective integrated urban wetland site in Sultanpur. The study finds that relying solely on urban wetlands for carbon drawdown presents several challenges, including land ownership restrictions, uncertainty around the effectiveness and quantity of carbon capture, and eligibility for market-based carbon crediting programs. Therefore, quantifying and certifying the contribution of urban wetlands to carbon reduction to fund communities through carbon crediting programs is currently difficult. However, artificial urban wetlands can support multiple sustainability goals, beyond just water management and carbon sequestration. They can create value in areas such as health and well-being, biodiversity, education, food security, behavioral changes, and social services. The research highlights the need for an integrated place-based approach to urban wetland development involving stakeholders from the outset of the project to define and facilitate collaboration towards shared outcomes for society, community, and the environment. Any urban infrastructure development aiming to achieve sustainability objectives beyond carbon capture should consider these findings.

A Comprehensive Study on Identifying Indicators for the Success of Services in Advance Digital Cities Based on Big Data and Cyber Technology

sciforum-074594

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Understanding the contributing factors behind prosperous or failing services provided in modernized urban areas is an essential study area. The primary purpose of this study is aimed to create a model capable enough to assess how successful certain services are within such areas incorporating said model's application into practical settings. To accomplish their objective, the researchers dedicated themselves to specific factors thought to be crucial determinants of success, such as 'smart economy,' 'connected citizens,' 'smart and digital governance,' 'advanced transportation,' 'sustainable environment', and 'smart living.' By combining fieldwork investigations with literary reviews conducted previously; researchers constructed research surveys that were designed to collect nominal values from multiple respondents covering these key factors measured as relevant criteria while adopting the Modified Delphi Method as well; looking at deriving best-fit indicators capable enough for consistently evaluating how efficient certain services are within modernized urban environments. It can help officials decide if Smart Cities can be deemed successful following ongoing evaluations after various pieces of research. In the latter part of this methodical approach, Structural Equations and IBM SPSS Amos toolsets were utilized to conduct a vast analysis to determine each aspect's effects on the primary objective of this study-evaluating efficient service provisions with information and communication technology in smart cities. As per the research, this article emphasizes the importance of understanding key factors, such as a smart economy, connected citizens, smart and digital governance, advanced transportation, a sustainable environment, and smart living in the context of successful service provision in smart cities, particularly in Pakistan. Governmental actions under the smart city initiative play a vital role in determining success rates. Nonetheless, governmental actions taken under the smart city initiative hold undeniable significance in determining success rates while delivering ICT-based services in intelligent cities.

Optimization of Integrated Anaerobic-Photocatalytic System for Biogas Production

sciforum-071057

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In wastewater treatment settings, developing CO₂ sequestration and biogas production technology will offer promising renewable energy and environmental solutions; however, it is a challenge to maintain a stable mainstream wastewater-energy system performance. Therefore, response surface methodology (RSM) via the Box Behnken design (BBD) was employed to optimize lab scale integrated anaerobic-photocatalytic system to reduce the carbon footprint from wastewater-produced biogas. Using local municipality wastewater, the organic loading rate (OLR; 0.394-1.3 kgCOD/L.d), hydraulic retention time (HRT; 1-31 days), and irradiation light source (visible, UV, and UV-vis) were modeled and optimized as input variables. Based on the RSM-BBD experimental matrix and response models developed, the optimized conditions obtained were OLR of 0.394 kgCOD/L.d, HRT of 20 days, and UV-light source with 75% overall desirability efficiency. This denotes the maximum biogas produced of 1263 mL/d, the energy efficiency of 55%, and the CO₂ emission reduction of 1735 kgCO₂ e/L. These findings revealed an integrated system as a methanation concept to pave way for large-scale implementation of the wastewater-energy generation model. Also, the estimation of CO₂ emission can become a promising tool to mitigate the carbon footprint towards a low-carbon economy.

A Tale of Four Cities: Assessing Net Zero Carbon Policy in Indonesia

sciforum-073744

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Indonesia has set ambitious targets to achieve net zero carbon emissions by 2060, but progress toward this goal has been slow. Climate change poses serious threats to archipelagic countries such as Indonesia, and the country has attempted to promulgate various policies to mitigate the risks.

We conduct an assessment of the recently established regulations regarding net zero carbon in Indonesia and analyze the effectiveness and challenges of this current establishment for achieving the goal in 2060. We compare the implementation of the net zero carbon policy in four different four cities located on four different islands in Indonesia: Jakarta, Pekanbaru, Ambon, and Lombok.

Our findings show that while Indonesia has made some progress in reducing carbon emissions, different cities pose challenges that need to be addressed specifically. Indonesia's current top-down net zero carbon policy lacks policy coherence, possesses an unfit institutional structure, and has not yet had a mechanism to maintain adequate participation among stakeholders.

We suggest a more bottom-up approach toward achieving net zero carbon in Indonesia and call for regular assessment to identify and address unique challenges and opportunities for each of the cities for more effective implementation.

This study should help Indonesia in formulating a more effective Net Zero Carbon Policy 2060, as well as provide guidelines for other middle-income developing countries worldwide facing similar issues on climate change mitigation.

Toronto Hub Abstracts

Poster Exhibition

Evolution of Latvian Urban Space in the Context of Nature

sciforum-073348

Silvija Ozola

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In Latvia, the urban environment is a result of human activities formed over many centuries. Already in the mid-first millennium BCE, Finno-Ugric (Baltic-Finnic) tribes, ancestors of the Livs, walked from the vicinity of Lake Ladoga and reached the River Salaca's mouth on the eastern shore of the Gulf of Riga, where the landscape and, first of all, the territory was an important resource for the viability of people. Six to ten groups of buildings close to each other along the Baltic coastline formed long-term inhabited unfortified settlements considered to be rural villages. The location of the population determined the process of urbanization and regulated relationships between people, society and nature. Natural elements provided optimal living conditions for inhabitants, regardless of the size of continuously inhabited settlements. Elements of natural landscape became the basis and the most important components of urban structures. In turn, cities had a constant impact on natural components, deforming and adapting them to their needs. Today, cities and urbanized areas are in continuous change. It is necessary to obtain a harmonious balance between the surrounding environment and the functional and economic needs of society. The growth of cities is related to the improvement of the compositional and aesthetic qualities of buildings. Research object: urban space of Latvian cities of Jūrmala, Ainaži, Saulkrasti and Salacgrīva. Research problem: qualities of Latvian cities had not been sufficiently studied in the context of nature to preserve their identity. Research goal: analysis of the evolution of urban space in the context of nature on the Baltic coastline in Latvia. Novelty: analysis of common and distinctive artistic and functional features of cities on the eastern shore of the Gulf of Riga. Methods: analysis of archive documents, cartographic materials, studies of published literature, an inspection of buildings in nature, and photo fixation.

The Impact of ESG Strategies on the Development of Green Cities

sciforum-074049

Zhanna Mingaleva

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The task of creating comfortable living conditions in large cities is part of the ESG strategy of countries and cities. This is especially important for megacities with high population densities and urban development, high traffic, a variety of harmful emissions and other negative impact factors. For many years, the largest cities in the world have been fighting for the title of the greenest city, while simultaneously proving the success of achieving ESG development goals. Ratings of green cities are also made in Russia. The city of Perm has been consistently ranked first in all Russian green ratings for many years. Using the example of the city of Perm, the analysis of factors affecting the state of the green infrastructure of modern industrial cities is carried out, and its relationship with the elements of ESG policy is shown.

Ecology (E): The green infrastructure of cities has a direct impact on the ecological state of the city. Trees are natural sinks of CO₂, dust particles, and other harmful emissions. They purify the atmosphere in residential areas, along highways, and in industrial zones. Trees increase air humidity in urban ecosystems, reduce surface overheating, improve air quality and normalize the ecological situation.

Society (S): parks and squares in areas of dense urban development are recognized as an effective way to relieve psychological tension and stress, relaxation and recovery of people in conditions of increased urban noise and aggressive environments.

Government (G): Control over the state of the green framework of the city, transition to the Low-Carbon Cities concept, reduction in CO₂ emissions from motor vehicles, and the implementation of other measures to create a green city are objects of management of municipal and local authorities. Without effective management, both the environmental and social effects of green infrastructure can significantly decrease.

Reference Framework for the Development of Green Businesses in Manizales (Colombia) Based on the Voluntary Market for Carbon Credits Using Blockchain Technology

sciforum-073219

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Carbon credits are mechanisms to mitigate the CO₂ that is released into the environment and reduce the harmful effects of climate change. A carbon credit is equivalent to one ton of CO₂ less in the atmosphere. The issuance of these bonds makes it possible to finance a green project that reduces CO₂ emissions while generating positive social impacts in a region. Therefore, it is essential that the same carbon credit cannot be applied to more than one project. However, the traceability of these bonds is insufficient and the voluntary market for carbon credits is still in its infancy at the Colombian level.

Manizales is chosen as a case study for the project because of its public approach to the conservation of natural resources. Indeed, it is a city located in the center west of Colombia that belongs to the coffee region, on the Central Cordillera of the Andes and near the Nevado del Ruiz with a population of 458,442 inhabitants and has the Río Blanco Protective Forest Reserve, considered an area of high biodiversity worldwide.

Having said the above, it is essential to contribute to the development of a reference framework using specific cases that help to better understand this market in regions with high potential for the development of green projects.

Investigating the Relationship Between Indoor Air Quality and Energy Efficiency in a Post-Pandemic World: Identifying the Parameters, Equations, and Software Tools for Analyzing Trade-Offs

sciforum-073579

Farah Shoukry, Rana Refaat, Sherif Goubran, Khaled Tarabieh, Ahmed Moustafa Marey

The American University in Cairo

As a result of the pandemic, energy efficiency concerns have become a renewed topic of interest among scholars, as the recent indoor air quality (IAQ) recommendations promoted maximizing fresh air through mechanical ventilation systems, at the same time advocated for the opening of windows within non-medical facilities. In this context, the main objective of this literature review to examine the relations between indoor air quality and energy efficiency in university classrooms, with a specific focus on the simulation methods used to measure HVAC energy efficiency in spaces. The literature review of high-impact factor journals and articles published post the pandemic will also investigate how to report on energy losses due to IAQ recommendations, and the parameters and equations that could be plugged into simulation software to assess energy losses in university classrooms.

The research will be organized into the following sections: (1) simulation methods for measuring HVAC energy efficiency, (2) parameters and equations for data simulation, and (3) energy losses due to IAQ recommendations. The data will be organized in a table format indicating category (e.g., type of simulation software), description of main attributes, and main references. The discussion section will then critique the data in an objective manner in line with the main research objectives. The preliminary research findings point towards the complexity of the relationship between indoor air quality and energy efficiency, which is associated with multi-parameters. That said, IAQ recommendations result in a trade-off between an improved air quality environment and energy efficiency.

Review of Artificial Lighting Strategies for Achieving Sustainable Energy Efficiency in Display Areas of Art Museums

sciforum-074497

Anthony Babatunde Sholanke, Funmilola Josephine Oyeyipo, Deborah Ihunanya Anosike

Covenant University

The provision of adequate and effective lighting, usually achieved through artificial means, is essential for preserving and maintaining artworks in excellent condition for viewers' appreciation in display areas of art museums. But due to the large amount of energy involved in consistently lighting the artworks, how to achieve sustainable energy efficiency becomes a key issue in the development of art museums. Also, the use of unsafe and unregulated artificial lighting results in increased operational carbon emissions that negatively affect the environment. Thus, this study examined artificial lighting strategies to identify the approaches that are not deleterious to interior functions, artefacts, and the environment in art museums and are energy efficient, with a view to make valuable contributions to ways of achieving sustainable energy efficiency in the development of art museums. The study adopted a systematic literature review to conduct. Data were gathered through comprehensive internet searches from studies in reputable online databases that include Scopus, Web of Science, and Google Scholar. The data were sieved by textual analysis, analysed by content analysis, and presented descriptively in themes. Studies published in English between 2002 and 2022, focusing on artificial lighting strategies, sustainable energy efficiency and display areas of art museums, were screened. The findings highlighted artificial lighting strategies that are not deleterious to interior functions, displayed works, and the environment, making them best suitable for achieving sustainable energy efficiency in developing and maintaining display areas in art museums. The study is a useful reference material to boost designers, students, and instructors' understanding of artificial lighting strategies that are suitable for use in display areas of art museums and similar settings. Researchers will also find the study useful reference material for further development.

Simulating Thermal Environment under Future Climate Change with Government 3D City Model in Japan

sciforum-073947

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The University of Tokyo

The impact of temperature rise due to global-scale climate change is becoming evident in each country, and, consequently, the outdoor thermal environment is deteriorating, especially in urban districts, being combined with the heat island effect. In order to manage such consequences in physical planning at a district scale, it is required to consider long-term outcomes for future changes of heat risks.

To acknowledge the spatial distribution of heat risks in a district, it is effective to utilize thermal environment simulation technologies based on the theory of Computational Fluid Dynamics (CFD) in the field of urban environmental engineering, where the CFD-based analysis methodologies for urban outdoor spaces are currently developing. Although the analysis requires 3D city models, MLIT (Ministry of Land, Infrastructure, Transportation and Tourism) has initiated "Project PLATEAU", which has aimed to deliver 3D city models of municipalities in Japan. As of May 2023, 132 cities' models are produced, embedding some urban information including building use and structure.

This study has coordinated these technologies and the government 3D model, simulating the thermal environment in urban district under future climate changes. We focused on one urban center neighborhood in Nagoya City, where its temperature is expected to rise over time, and conducted CFD-based analysis on outdoor spaces during summer daytime in the 2020s, 2050s, and 2090s. Given the framework of Shared Socioeconomic Pathways and Representative Concentration Pathways, the decisions on future weather conditions among scenarios were made by referring to the climate data downscaled from global climate models.

This process enabled the outcomes to be visualized corresponding to the different scenarios, with the future situations in a certain area being inferred from some indicators such as temperature and radiation. This study has thus contributed from the perspective of climate change adaptation in establishing one of the assessment systems for urban sustainability.

The Case Studies in Latvia: Possibilities of Implementing the Quadruple Helix Concept as the Base of the Next Generation a Public-Private-Partnership Model for Smart Cities

sciforum-073548

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The concept of the Quadruple Helix represents new thinking in the innovation process and innovation policy. It is an opportunity to use researcher-driven innovative approaches to achieve results. Studies have already been analyzed that aim to create a new concept that combines the existing public–private partnership for society (people or communities) to become a state–private–people partnership for smart cities.

The authors of the article will illustrate their experience and success stories in Latvia, which are based on the Living Labs concept.

The authors share methods tested in practice, and real examples to implement more public and private initiatives and projects, related to public (people) involvement. A reasonable basis for future research is a possible move towards the Quintuple helix partnership and its further adaptation for smart cities.

The presentation is based on the achievements of researchers in the fundamentally applied research project funded by the Latvian Science Council "Quadruple Helix Concept as the base of the next generation PPP model" (Nr. lzp-2020/1-0062.



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