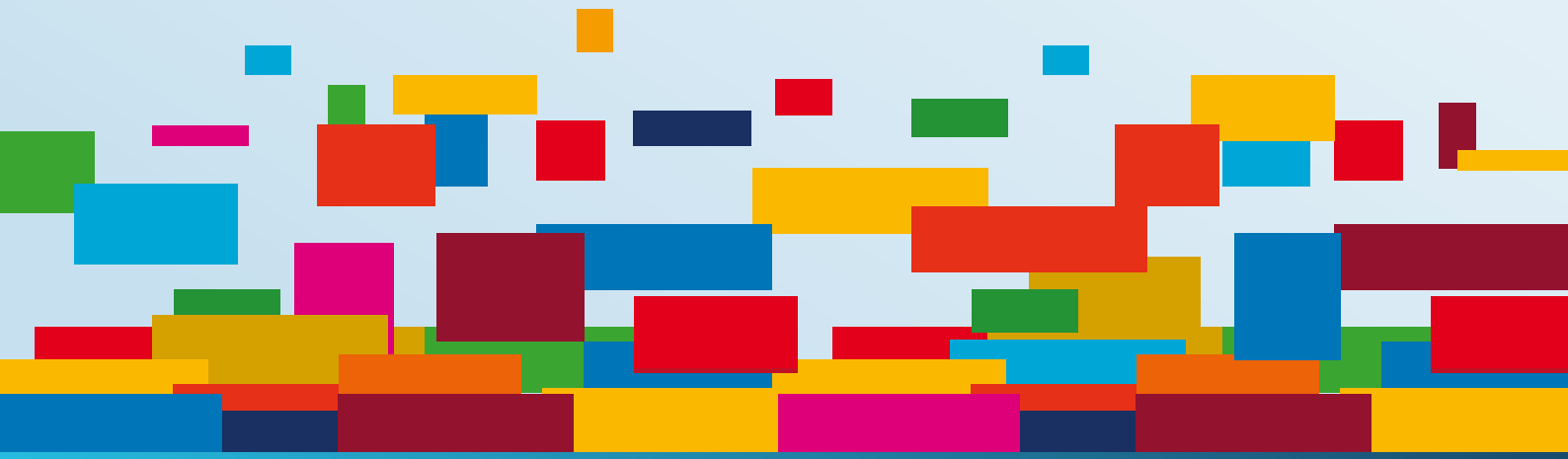
The 9th World Sustainability Forum

13–15 SEPTEMBER 2021 | ONLINE



Program and Abstract Book

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IDSAI

IETI

IRIEM

SWST – International Society of Wood Science and Technology

SCS Swiss Chemical Society

The 9th World Sustainability Forum

VIRTUAL
Switzerland
13–15 September 2021

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Welcome from the Chairs

September 2021 marks the sesquianniversary of much of the world entering into various forms of lockdown or pandemic management as well as the 6th anniversary of the 2030 Agenda for Sustainable Development and the UN Sustainable Development Goals. The pandemic has challenged our expectations for the future and has prompted a re-evaluation of the relationships between society, politics and the commercial world.

In the 9th World Sustainability Forum, we will consider all aspects of these new and evolving relationships and their impact on sustainability. Although all topics are welcome, we will have major sessions on the topics of Business & Finance, Climate, Health & Medicine, Water, and Education.

The health crisis and its consequences will not guarantee a more sustainable future but it certainly provides a narrow window of opportunity to rethink outdated economic, social, and environmental arrangements. It is encouraging to note the widespread calls for a sustainable "new normal".

We hope that this forum will contribute to the global debate as the world contemplates returning to a new normal and will contribute to establishing platforms and networks among stakeholders including lawmakers, commerce, the general public and academic disciplines. The aim is to bring structure to the vision of a sustainable world which deals fairly and transparently with the multifold issues of sovereignty, governance and society that have arisen in the pandemic.

Following the initiative in WSF 2020 of making an event on sustainability more sustainable, the 9th World Sustainability Forum will be an online global event.

Abstract Submission is open until 13 July 2021. For further details on how to submit, please click here. Please note that the abstract submission and conference registration are two separate processes. If you wish to simply participate as an attendee, you can register here.

The World Sustainability Award and the Emerging Sustainability Leader Award, funded by the MDPI Sustainability Foundation and the Sustainability journal respectively, will be conferred during the conference. Both the World Sustainability Award and the Emerging Sustainability Leader Award are endowed with a sum of USD 100'000 and USD 20'000 respectively.

The 9th World Sustainability Forum will take place from 13 - 15 September 2021.

We, the chair and the organization team, are very much looking forward to welcoming you to the 9th World Sustainability Forum. Let us grab this opportunity to advance the sustainability agenda!

Prof. Dr. Ed Constable
Conference Chair

Certificate of Attendance

Upon request, the participants of the event will receive an electronic Certificate of Attendance by email once the event is concluded.

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General Information

Sustainability (ISSN 2071-1050; CODEN: SUSTDE) is an international, cross-disciplinary, scholarly, peer-reviewed and open access journal of environmental, cultural, economic, and social sustainability of human beings. *Sustainability* provides an advanced forum for studies related to sustainability and sustainable development, and is published semi-monthly online by MDPI. The Society for Urban Ecology (SURE), Canadian Urban Transit Research & Innovation Consortium (CUTRIC) and International Council for Research and Innovation in Building and Construction (CIB) are affiliated with *Sustainability* and their members receive discounts of the article processing charge.

Among other databases, *Sustainability* is indexed by the Science Citation Index Expanded (Web of Science), MEDLINE (PubMed) and other databases. Full-text available in PubMed Central.

Journal Webpage: https://www.mdpi.com/journal/sustainability
Impact factor: **3.251** (2020)
5-Year Impact Factor: 3.473 (2020)

World Sustainability Award - Emerging Sustainability Leader Award

Open for Nominations

The World Sustainability Award and the Emerging Sustainability Leader Award are funded to encourage new initiatives and developments in sustainability with the ultimate aim to foster the transfer from sustainability research to sustainable practices and societies. In this spirit, sustainability is understood as the interdependence between economic, social, and environmental concerns for mutually beneficial regional and global development. Sustainability is associated with a multitude of academic disciplines, and it is circumscribed by the United Nations Sustainable Development Goals.

The World Sustainability Award, funded by the MDPI Sustainability Foundation, will be conferred upon individual researchers or research teams who have made an outstanding academic or societal contribution to sustainability in general, or to a sustainability-relevant issue in particular. A joint award, shared by up to three recipients, is possible. The award includes a monetary prize of USD 100'000.

The Emerging Sustainability Leader Award, funded by the MDPI journal Sustainability, will be conferred upon an individual researcher aged 40 or under at the time of the submission deadline, who has made an outstanding academic or societal contribution to sustainability in general, or to a sustainability-relevant issue in particular. The award includes a monetary prize of USD 20'000.
For more information, see http://wsforum.org/instructions.

Program

Keynote Speakers

Prof. Dr. Umberto Berardi
Canada Research Chair in Building Science, Ryerson University, Canada

Prof. Dr. Heejun Chang
Portland State University, USA

Prof. Dr. Beverly Dawn Metcalfe
ESA Business School, Beirut, Lebanon

Prof. Dr. Ingo Eilks
University of Bremen, Institute for Science Education (IDN), Germany

Prof. Dr. Vikneswaran Nair
University of The Bahamas, The Bahamas

Session Chairs

Prof. Dr. Barbara Aquilani
Tuscia University of Viterbo, Viterbo, Italy

Prof. Dr. Lynette Cheah
Singapore University of Technology and Design (SUTD), Singapore

Prof. Dr. Jordi Colomer Feliu
University of Girona, Catalonia, Spain

Professor Kiran Fernandes
Durham University Business School

Prof. Dr. Hamid Doost Mohammadian
University of Applied Sciences (FHM), Germany

Prof. Dr. Donato Morea
University of Cagliari, Italy

Ms. Regula Keller
ZHAW School of Life Sciences and Facility Management Institute of Natural Resource Sciences

Program at a Glance

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13–15 September 2021</td></tr>
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Conference Program

Day 1: Monday 13 September 2021

Main Stream Program	
10:00-10:15	**Welcome from the Chair**
10:15-10:55	**Keynote Speaker: Prof. Dr. Beverly Dawn Metcalfe** Topic: Women, Sustainably and International Development: A Critique of Social Progress and Ongoing Challenges for Female Empowerment
11:00-12:15 Health & Medicine Session Chaired by Regula Keller	
11:00-11:10	Sciforum-032073 – Diana Benjumea Mejia | Evidence of Community Urban-Farming Activism in Natural Spaces and its Impact in the Health and Well-Being of Medellin informal Communities
11:10-11:20	Sciforum-032016 – Evelyne de Leeuw | Healthy Cities Today and Other "Theme cities" Networks: A Survival Guide
11:20-11:30	Sciforum-031079 – Regula Keller | Green Hospitals - Environmental Hotspots and Best Practice in the Health Sector
11:30-11:40	Sciforum-048287 – Sanjoy Chanda | Using the Theoretical Domains Framework to Identify Sociocultural Barriers and Facilitators to Access and Use of Primary and Maternal Healthcare Services by Rural Bangladeshi Women
11:40-11:50	Sciforum-030869 – Roderick Lawrence | Responses to Urban Health Challenges in the Context of Rapid Urbanization
11:50-12:00	Sciforum-033632 – Ashok Vaseashta | Impact of Microplastics on Marine and Freshwater
12:00-12:15	Q&A
BREAK	
14:00-15:15 Food, Agriculture & Soil Sciences AND Transport & Mobility Session Chaired by Lynette Cheah	
14:00-14:10	Sciforum-048272 – Shilpa Mishra | Anticipating Sustainability of Smart Energy Network for Electric Vehicles in Delhi: Responsible Innovation Approach
14:10-14:20	Sciforum-037460 – Farcas Anca | Sustainable Approaches for Reintegration of Cereal Waste Into Valuable Products
14:20-14:30	sciforum-048322 – Julia Velte | A Quantitative Cost-Benefit Analysis of Pesticide Use in German Agriculture
14:30-14:40	Sciforum-046298 – Tamás Bányai | Optimisation of Sustainable in-Plant Supply in a Cyber-Physical Production System

14:40-14:50	Sciforum-048480 – Thomas Chen | Integrating Social Media Data for Computer Vision-Based Applications for Autonomous Driving and a Safe, Energy-Efficient Future
14:50-15:00	Sciforum-048263 – Héctor Mojica-Zárate | Sustainable Agropolis: Integrated Strategic Management Instrument in the Face of Global Challenges in Arid Territories of Mexico
15:00-15:15	Q&A
World Sustainability Award Ceremonies 15:30-17:30	

Day 1: Monday 13 September 2021

Satellite Sessions Program	
11:00-12:30 Higher Education and Research – How universities around the world engage with Sustainability and build partnerships for the SDGs Organization: International Association of Universities (IAU)	
11:00-11:05	Welcome by Hilligje van't Land, Secretary General International Association of Universities (IAU)
11:05-11:15	Input presentation IAU | Hilligje van't Land
11:15-11:25	sciforum-050158 – Hilligje van't Land | Strengthening the role of Higher Education and Research for Sustainability: IAU HESD
11:25-11:35	sciforum-050632 – Jonghwi Park | Cross-Sectoral Partnerships in Higher Education and Why We Need Them for Sustainable Development
11:35-11:45	sciforum-050633 – Ole Ottersen | Sustainability and Partnerships for the SDGs at Karolinska Institutet
11:45-12:00	Q&A
12:00-12:10	**Conclusions** Moderator: Pam Fredman, IAU President, Former Rector of University of Gothenburg, Sweden
BREAK	
12:30-14:30 Technological Innovation for Sustainable Development Organization: Artificial Intelligence for Development Agency (AI4DA)	
Presenters	Angela Sarafian COO at Artificial Intelligence for Development Agency (AI4DA) Bogdan Banjac R&D Officer at Artificial Intelligence for Development Agency (AI4DA) Lina Fischer Business Development & Strategy Officer at Artificial Intelligence for Development Agency (AI4DA) Alberto Turkstra Project Manager at Diplomatic World Institute

Day 2: Tuesday 14 September 2021

Main Stream Program	
10:00-10:40	**Keynote Speaker: Prof. Dr. Ingo Eilks - Topic: The Incorporation of Sustainability into Chemical Education**
10:45-12:00 Education Session Chaired by Jordi Colomer Feliu	
10:45-10:55	Sciforum-048026 – Ya-Ching Chang | Developing Key Competencies for Sustainability: A Preliminary Study on the Effective Group Learning for College Students
10:55-11:05	Sciforum-048492 – Satyendra Nath Mishra | Mindful Consumption and De-growth: A Tool of Systemic Change for Sustainable Future
11:05-11:15	Sciforum-048327 – Stella Apostolaki | Promoting Education on SDGs via Enhanced Partnerships and Collaborative Structured Actions at Undergraduate Level Across Three Institutions Located in Three Continents
11:15-11:25	Sciforum-048459 – Viktorija Mangaroska | Sustainable Architectural Education, the Case Study of Green Design in the Architectural Design Studios in North Macedonia
11:25-11:35	Sciforum-031975 – Martin Bascopé | A Crucial First Step: Early Childhood STEM Education for Sustainable Future
11:35-11:45	Sciforum-048405 – Kyra Wang | Evaluating the Effectiveness of PEAR, an Augmented Reality Serious Game Promoting Indvidiual Environmental Action
11:45-12:00	Q&A
BREAK	
12:15-13:30 Energy Session Chaired by Hamid Doost Mohammadian	
12:15-12:25	Sciforum-048286 – Phuang Zhen Xin | Large Scale Solar or Palm Biodiesel? A Comparative Life Cycle Assessment for Renewable Energy Landscape in Malaysia
12:25-12:35	Sciforum-031387 – Volker Stelzer | Optimizing Sustainable Energy Planning due to Sustainable Energy Balances and SDG-Based Indicators
12:35-12:45	sciforum-047919 – Caroline Gebara | National SDG-7 Performances in an Absolute Sustainability Perspective
12:45-12:55	Sciforum-048386 – Hamid Doost Mohammadian | Smart Ubiquitous Sustainable Blue-Green Energy Management Towards a New Concept Sme 5.0/Hybrid Sme Through the 5th Wave Theory
12:55-13:05	Sciforum-032043 – David Cook | A Cascade Model and Initial Exploration of Co-Production Processes Underpinning the Ecosystem Services of Geothermal Areas
13:05-13:15	Sciforum-048338 – Lucas Cesilla de Souza | Technoeconomic and Environmental Assessment of Marine Biofuels
13:15-13:30	Q&A
BREAK	
14:00-15:15 Business & Finance Session Chaired by Kiran Fernandes	
14:00-14:10	Sciforum-030492 – Kiran Fernandes | Estimating the Wider Value Generated by UNESCO' s Designations in the United Kingdom

14:10-14:20	Sciforum-048268 – Harsha Sheelam | Waste-to-Resource Industry and its Contribution to Sustainability
14:20-14:30	Sciforum-047287 – Rizwan Shabbir | Sustainability Barriers and Firm Performance: A Case of Textile Supply Chains
14:30-14:40	Sciforum-031941 – Joachim von Heimburg | A Collaborative Ecosystem for Responsible Innovation to Create more Sustainable Businesses
14:40-14:50	Sciforum-047433 – Christian Walter | Sustainable Financial Risk Modelling: The Case of Solvency II
14:50-15:00	Sciforum-048467 – Selma Oliveira | We Need to Talk About the Digital Capabilities on Sustainable Value Creation
15:00-15:15	Q&A
15:20-16:00	**Keynote Speaker: Prof. Dr. Vikneswaran Nair – Topic: The rural tourism sector in the Bahamas, post COVID-19**

Day 2: Tuesday 14 September 2021

Satellite Sessions Program	
11:00-12:30 7479c | Using Blockchain to Reduce Electronic Waste and Boost Recycling to Become Commercially Viable	
Presenter	Nina Schmulius Sciforum-050676– Nina Schmulius | Awareness for E-waste: How to Incentivize Consumers to Do More Recycling Sciforum-050677 Nina Schmulius | Blockchain as Gamechanger Q&A
BREAK	
15:00-17:30 Circular Carbon Economy: Paving The Way for a Sustainable Future Organization: King Abdullah University of Science and Technology (KAUST)	
15:00-15:05	Welcome from the Conference Chair of the World Sustainability Forum Professor Edwin Constable
15:05-15:10	Opening remarks on the KAUST WSF Satellite Session Professor Tony Chan
PANEL 1 | CARBON CAPTURE, USAGE AND STORAGE: R&D INNOVATIONS TO INDUSTRY AND GOVERNMENT DEPLOYMENTS	
15:15-15:30	Sciforum-049575– Aqil Jamal| Role of CCUS in Achieving Global Decarbonization Goals
15:30-15:45	Sciforum-047956– David Allen | A research agenda for chemical, biochemical and mineralization approaches to gaseous carbon waste utilization
15:45-16:00	Sciforum-047965 – Karl Burkart | Animating the Global Carbon Cycle: the technical potential of restoration and rewilding as a carbon removal strategy
16:00-16:15	Sciforum-048072 – Mani Sarathy | Green Hydrogen and Clean Fuel Technologies in the Circular Carbon Economy
16:15-16:30	Sciforum-049656 – Jorge Gascon| The KAUST Circular Carbon Initiative

PANEL 2 | POLICY AND CARBON MANAGEMENT STRATEGIES

16:35-16:50	Sciforum-049574 – Noura Bint Turki Al Saud| The Circular Carbon Economy	A Global Blueprint for Carbon Circularity & the Deployment of a Saudi Circular Carbon Economy Program
16:50-17:05	Sciforum-049341 – Adam Sieminski| The Role of Policy in Carbon Management
17:05-17:20	Sciforum-049342 – William McDonough| Carbon is not the Enemy: Addressing Climate Change as a Design Problem
17:30	End of the session

Day 3: Wednesday 15 September 2021

Main Stream Program	
11:00-12:15 "Other" Session Chaired by Barbara Aquilani	
11:00-11:10	Sciforum-048335 – Vindya Hewage | Natural vs Cultural Tourism Development: Modeling Sustainability Concerns and Residents' Perceived Support
11:10-11:20	Sciforum-031091 – Marwan Elmubarak | Beyond Tokenism: Rethinking the Approach to Sustainable Urban Development and Architecture in Cities of the Developing World
11:20-11:30	Sciforum-048131 – Jana Hilal | Evaluating Alternative Policies Aimed at Reducing Pollution From Disposable Plastics Using Topsis
11:30-11:40	Sciforum-031205 – Linda Tesauro | Sorting Organic Waste: The Impact of New Infrastructures
11:40-11:50	Sciforum-031266 – Elizabeth Kempen | We Aren't There Yet: Female Consumers' Unintentional Sustainable Apparel Behaviour Impacting on Sustainable Development Goal 12
11:50-12:00	Sciforum-032044 – David Cook | Synergies and Trade-Offs in the Sustainable Development Goals – The Implications of the Icelandic Tourism Sector
12:00-12:15	Q&A
BREAK	
12:45-14:00 Climate Session Chaired by Donato Morea	
12:45-12:55	Sciforum-048289 – Puja Ray | Ecological Interactions and Impact of Biological Control Agents of Aquatic Invasive Plants Under Changing Climatic Conditions
12:55-13:05	Sciforum-047516 – Nina Danilina | Adapting Cities to Climate Change: Case Study of International Experience in Jean Monnet Project Cleux
13:05-13:15	sciforum-031276 – Natalia Odnoletkova | Data-Driven Analysis of Climate Change in Saudi Arabia Over the Last Four Decades
13:15-13:25	Sciforum-030886 – Mariarosaria Angrisano | Nanotechnologies and Nanomaterials for Circular Design of Buildings and the Adaptive Reuse of Cultural Heritage
13:25-13:35	Sciforum-031950 – Helmuth Kreiner | A Multi-Interdisciplinary Approach to Achieve the Sustainable Development Goals - The Pathway to Sustainable Cities and Communities in Austria
13:35-13:45	Sciforum-048343 – Godwin Obi | Carbon Footprint Estimates for the Grid-tied Nigerian Power Sector
13:45-14:00	Q&A
14:05-14:45	**Keynote Speaker: Prof. Dr. Umberto Berardi - The future of the built environment in face of Climate Changes and global challenges**
15:00-16:30	**Introducing the SDG Book Series**
16:45-18:00 Water Session Chaired by Friedrich Port	
16:45-16:55	Sciforum-047690 – Chaima Ouled Amor | Preparation and Characterization of Photocatalytic Dysprosium-Doped TiO2 Nanoparticles for Water Treatment: Solar Photodegradation of Methylene Blue Dye

16:55-17:05	Sciforum-047872 – Calvin Jose Jol | Treatment of Tropical Brackish Peat Water with Continuous Electrocoagulation
17:05-17:15	Sciforum-048305 – Ria Ghosh | Alternanthera Phyloxeroides: Do We Need to Be Concerned About This Freshwater Weed in Approaching Decades?
17:15-17:25	Sciforum-048316 – Fabio Sporchia | Global Rice Consumption and Water Scarcity: Refining the Assessment by Using Crop-Specific and Country-Specific Factors
17:25-17:35	Sciforum-048347 – Friedrich Port | Providing Clean Pathogen-Free Water to Remote Villages Lacking Electricity Is Feasible, Inexpensive and Sustainable
17:35-17:45	Sciforum-048478 – Thomas Chen | Computer Vision-Based Remote Monitoring of Ocean Salinity for a Sustainable Future
17:45-18:00	Q&A
18:10-18:50	**Keynote Speaker: Prof. Dr. Heejun Chang – Topic: Water security and spatial equity in a changing climate and urbanization**

18:50-19:00 Closing Ceremony

Day 3: Wednesday 15 September 2021

Satellite Sessions Program

7:00-9:00 AGEn \| Achieving Energy Excellence through Comprehensive Management System

Presenters	Mohammad Taufan Department Head - Environment and Social Responsibility Astra Michael Soegiri Astra Green Energy Project Manager - Environment and Social Responsibility Astra Q&A

BREAK

11:00-13:00 NAHGAST \| Enabling Sustainable Food Choices Out-of-Home

Presenters	Sciforum-049661– Melanie Speck| Enabling sustainable food choices out-of-home – Insights from the project NAHGAST II Sciforum-049662– Tobías Engelmann | Comparison of two methods for determining plate waste: videotaping returned plates and weighing leftovers Sciforum-049663– Pascal Ohlhausen| Insights from NAHGAST real-world-laboratories: Increasing sustainable food choice and reducing plate waste with the use of nudges in the out-of-home catering sector

BREAK

16:00-18:00 ESEIA \| Sustainable use of Bioresources

Sustainable use of Bioresources I: Sustainable Bioenergy

Presenters	Sciforum-049763 – Michael Bongards | Innovations and potential of bioenergy production and utilization in the urban context

Sciforum-050057 – Markku Huhtinen | Improved Solid Biofuels for Africa
Sciforum- 050485 – Sandor Bartha | Sustainable Biorefinery Model Based on Black Sea Seaweeds from Romanian Costal Area

Sustainable use of Bioresources II: Beyond Bioenergy

Presenters

Sciforum- 049765 – Fabio Montagnino | An overview of Bioresources as materials for energy applications
Sciforum-049764 – Božidar Šantek | Balancing of bioresources and energy production
Sciforum- 050487 – Luis C. Duarte | Biomass Fractionation: The Search for an Industrial Process Standard
Sciforum-049767 – Marlene Kienberger | Potential Applications of Lignin

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Sessions

BF. Business and Finance
C. Climate
HM. Health and Medicine
W. Water
ED. Education
EN. Energy
FAS. Food, Agriculture and Soil Sciences
TM. Transport and Mobility
O. Other

Abstracts

Session BF. Business and Finance

Posters' abstracts

Sciforum-048432: Bank credit card default classification based on clustering using machine learning algorithms

Mantas Lukauskas[1, 2], Tomas Ruzgas[1]

[1] Kaunas University of Technology
[2] Zyro Inc

Due to an unprecedented increase in data worldwide, the financial sector and other industries and businesses are struggling to remain competitive by transforming themselves into data-driven organizations. By analyzing large numbers of data, organizations can gain valuable information to determine their strategic plans, such as risk control, crisis management, or growth management. For example, one of the biggest problems for banks is determining the creditworthiness of bank consumers and whether these customers will repay the loans granted to them on time and at all times. At present, banks have a huge number of data that can be used to construct models to predict this. Such forecasting allows for much faster data analysis and does not require expert judgment, which is much more expensive in this case. This presentation will provide information about different machine learning algorithms and their use in clustering banks customers and subsequent classification. The study uses SEB Big Data Challenge data with which the analysis was performed. In total, this dataset contains data from more than ten million customers. About twenty different indicators/characteristics describe all observations/clients. During the first stage of the study, data processing was performed: filling in the missing values with different methods, balancing the data set, and comparing different normalization algorithms. In the second stage of this study, data clustering (k-means, DBSCAN, OPTICS, etc.) was performed, based on which customer classification models were later developed. Different classification algorithms (artificial neural networks, XGBoost, LightGBM, Catboost, etc.) were used in the study. A comparison was made with the algorithms' reliability, accuracy, and computation time to determine which algorithms were the best. The results of this study allow comparing the influence of different data processing techniques, different clustering algorithms, and different classification algorithms on the accuracy of customer classification.

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Sciforum-048205: Circular Economy and Phytoremediation: A Relationship Geared towards the Viability of a Truly Self-Sustainable World

Pedro A. Martin Cervantes, María del Carmen Valls Martínez

[1] Universidad de Almeria

Evidence has shown how the archaic linear economy has pushed the planet to such pollution limits that soon it will be unsustainable, causing environmental degradation and impacting the health of human communities. There are very few alternatives, which nominally implies the creation of an authentic circular economy, which is within all people's reach and whose economic cost can be assimilated by all nations. In this sense, phytoremediation has much to contribute to self-sustainability since its added value lies in the use of several natural sciences (biology, botany, and chemistry) in the regeneration of soils and water flows polluted by humans. This paper briefly defines the main techniques associated with phytoremediation (phytoextraction, phytofiltration, phytostabilization, phytovolatilization, phytodegradation, rhizodegradation, and phytodesalination), specifying in each case how the intermediation of the plant kingdom is capable by itself of restoring nature to its original state, being at the same time also capable of generating biofuels that palliate economies' dependence on fossil fuels.

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Sciforum-048408: COVID-19: A review of India's MSME sectors

Ramesh Kumar

[1] Assistant Professor, Department of Economics and Rural Development, Alagappa University (State University), Karaikudi, Tamil Nadu, India.

The COVID-19 pandemic has had an abrupt impact on India's micro, small, and medium-sized enterprises (MSMEs). As per the data available from the Central Statistical Office, the share of MSMEs in gross value added is 33 percent, and the share in the total gross domestic product is 30 percent of India as a whole. In terms of employment after agriculture, MSMEs provide more than 110 million jobs in both rural and urban areas, which is nearly 9 percent of the total population of India, and the largest employment provider after the primary sector. The MSMEs in India are led by three important sectors, namely manufacturing, electricity, and trade and other services. After the declaration of the pandemic by the WHO, the lockdown in India was enforced by the union and state governments in two waves of COVID-19 with full and partial restrictions. The small and medium scale enterprise was severely encountered in both the waves (2020 and 2021). Before COVID-19, the demonetization and GST (Goods and Services Tax) regulations of the union government negatively impacted the business of MSMEs. The COVID-19 pandemic considerably affected MSMEs in various forms, viz., disruptions of the supply chain, the shutdown of demand- and supply -side markets, mental health issues, the balance between between business and life, and inadequate finance to meet day-to-day life and business needs such as rental and electricity charges, wages, and compensation to workers. After ending of first wave, MSMEs gradually started their businesses until December 2020; however, the second wave started in February 2021 and affected MSME businesses at a national level. This study aims to understand the impact of COVID- 19 on India's MSME sectors by analyzing the value of output, employment and trade, and other related sub-sectors of MSMEs. This study also highlights the significant policy matters to recover the unsoundness of MSMEs sectors under COVID-19 pandemic times and in different phases of national-level lockdown. The results show the manufacturing growth rate became negative 22 percent in March 2021 and 0.1 percent in February 2021. The union government introduced many financial packages to battered businesses. This study concludes with how the sustainability of economic growth will depend on the recovery and strength of MSMEs sectors.

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Sciforum-046132: The Impact Of the COVID-19 Pandemic on Transition towards Sustainable Consumption Behavior through Religiosity

Aysha Batool, Rizwan Shabbir

[1] Government College University, Faisalabad, Pakistan

The COVID-19 pandemic has had obvious and critical effects on consumers' purchasing, trading, and sustainability behaviors. Due to lockdown and social distancing situations, consumers are experiencing with fear, stress, and changes in their daily routines. In such situations, many people feel inclined towards religious norms and practices to seek peace of mind and spiritual meditation. Religion is also considered an important element in shaping consumer behavior. The COVID-19 pandemic is also expected to bring positive impacts in terms of environmental and social sustainability. Thus, owing to the burning issues of sustainability and the coronavirus pandemic, this study intends to investigate the impact of COVID-19 fear and perceived knowledge on religiosity and sustainable consumption behavior (SCB). A total of 421 usable questionnaires were collected online from Pakistani Muslim consumers through a structured survey using Google Forms. Hypotheses were tested using SmartPLS-3 software. The findings indicate that COVID-19 fear and perceived knowledge 1) positively impact religiosity and 2) enhance SCB in Muslim consumers. This paper contributes to the literature by providing empirical research about the impact of the novel coronavirus on SCB. The specific role of religiosity and perceived knowledge is investigated to understand how people are concerned about coronavirus and inclined towards religious activities to cope with fear. The study provides important insights about the potential positive impacts of COVID-19 for sustainability, which marketing managers, as well as policymakers, can capture to mitigate the negative effects of this pandemic. Furthermore, the increase in SCB can trigger sustainable production which can help achieve Sustainable Development Goal 12. This study offers significant and timely evidence about important hypotheses, yet similar works in other cultures and religions can help in determining the global impacts of COVID-19 on consumer behavior.

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Selected talks

Sciforum-048268: Waste-to-Resource Industry and its Contribution to Sustainability

Harsha Sheelam, Nishtha Rai, Aditi Saurav

[1] Icfai Business School (IBS, Hyderabad)

The three major entities in economics are households, businesses or firms, and Government. The authors are met with the challenge of where waste management responsibility is primarily taken up by the municipality. Government initiatives and programs have been constrained to waste removal and disposal. Moreover, there is a lack of literature about the importance and relevance of the the waste-to-resource industry, and a lack of public-private enterprise partnership models that focus on sustainability, social responsibility and their economic contribution. The authors examine what is the "new normal" for achieving sustainability through waste. In this study, we draw a conceptual framework for understanding the importance of the waste-to-resource industry through the Sustainable Benefit Triangle (SBT) which is cornered by Waste-to-Resource Industry, Government, and Waste Producers (households and businesses). The conceptual framework also supports the proposition for a smart and sustainable way to waste removal, transformation, and disposal mechanisms of the Government and businesses through the *"Sansaadhan Abhiyaan"* (Resource Program) which fosters the public–private–societal relationships as established by the SBT. We employ qualitative research by focusing on the framework of process theorization where we intend to study this growing impact of the waste-to-resource initiatives on society at large. Data for the study are collected through telephonic and personal interviews of business practitioners, managers, working professionals, public policy makers, and the society, located in seven major states of India, as well as public secondary informational sources. To resolve the problem of conventional sustainability theories, initiatives, and programs, the authors contribute to relevant literature in sustainability and unexplored concepts of the waste-to-resource industry through a theoretical relationship framework. We apply epistemological analysis and process theorization, and generalize the results with our qualitative data. The findings of this study illustrate (1) how the SBT will facilitate collecting waste from the three large economic entities (2) transformation into a resource in the the waste-to-resource industry, (3) consequential contribution to the *"Sansaadhan Abhiyan"*, (4) effective and innovative disposal mechanisms. We discuss new avenues for academics in the waste-to-resource industry, sustainability, and the three entity model, additionally; explain how this would help businesses and firms to guide their CSR and sustainability activities in these areas, with both social and economic perspectives.

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Sciforum-031941: A Collaborative Ecosystem for Responsible Innovation to Create more Sustainable Businesses

Marc Dreyer[1, 2], Monica Schofield[2, 3], Joachim von Heimburg[2, 4], Anne Goldberg[2, 5]

[1] Futopedia.com
[2] EIRMA RI Task Force
[3] TUTECH INNOVATION GMBH
[4] Innovate How To Innovate
[5] in transition

Business leaders are ever increasingly confronted by something akin to the well-known 'prisoner's dilemma'. They need to honour their fiduciary duties and achieve the financial returns that can be reasonably expected by their shareholders. On the other hand, focusing on profitability in the short term can undermine the basis of future revenues and profits by not taking into account impacts in the longer term, such as by climate change. Responsible innovation (RI), the process of generating sustainable benefits to both entrepreneurs and society, offers a conceptual way forward by balancing longer term impacts and market opportunities. In order to work, RI requires a collaborative innovation ecosystem in which all stakeholders consider both their specific role and broader responsibility: society, with its citizens and consumers voting for their representatives and making purchasing decisions; academia, responsible for generating knowledge that supports evidence-based policies and assessment of innovation benefits; government, ensuring a fair and level playing field with smart policies and regulations fostering RI; and business, by generating value for shareholders and stakeholders alike whilst managing risks with transparency and integrity. Such an ecosystem will ensure the necessary conditions to steer and reward industry towards delivering innovation with societal value while remaining competitive.
We will elaborate and discuss the necessary conditions for and best practices of such a RI ecosystem, its links to sustainable finance, its present shortcomings related to the standards for the metrics, the databases, and the assessment methodologies, and we will propose a direction for the assessment of its maturity level to make it viable and effective.

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Sciforum-030492: Estimating the wider value generated by UNESCO' s designations in the United Kingdom

Kiran Jude Fernandes[1], Nikolaos Goumagias[2], Matthew Rabbagliatti[3]

[1] Durham University
[2] Northumbria University
[3] UK National Commission for UNESCO

In September 2015, the United Nations General Assembly adopted a set of objectives related to promoting and supporting sustainable development around the globe through education, human knowledge, communication, and culture. These objectives are commonly known as the Sustainable Development Goals (SDGs) and are an inter-dependent set of 17 goals that 195 Member States have agreed to achieve by 2030. As a specialized agency of the United Nations, and the global lead on education, UNESCO has a vital role to play in delivering the SDGs. UNESCO's global network of 'designations', including World Heritage Sites, Biosphere Reserves, UNESCO University Chair Programme, and Global Geoparks, also play an essential role in promoting and supporting local sustainable development and achieving the SDGs. However, the different geographic, cultural, and political regimes, under which UNESCO designations are called to operate, pose significant challenges for the network to effectively be managed and contribute towards the SDGs. Moreover, the heterogeneity of organizational structures and boundaries in terms of efficiency, power, and competence, prevents UNESCO designations "value-added" activities from reaching their full potential. We performed a survey of 74 designations in England, Northern Ireland, Scotland, and Wales. Drawing from the business model component framework, our research aims to: i) identify value-generating configurations of organizational structures that transcend designations' type; ii) estimate the value generated by the designation and their contribution to UNESCO's SDGs; and, iii) develop a framework that can be used by national governments to make sense of UNESCO's value generated activities. The framework can help UNESCO's National Commissions to improve the efficient management of the designation's global network and allow countries with different levels of economic and societal development to cooperate to tackle contemporary global challenges.

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Sciforum-047287: Sustainability Barriers and Firm Performance: A Case of Textile Supply Chains

Aysha Batool, Rizwan Shabbir

[1] Government College University, Faisalabad, Pakistan

Businesses are incorporating sustainability aspects in supply chains but they face various barriers in the adoption of green and sustainable supply chain management practices. Empirical evidence about the impact of such barriers on firm sustainability practices and performance is rare. This paper aims to fill this gap by investigating this relationship and the degree to which barriers to sustainability (SB) hinder the implementation of environmental management practices (EMP) and supply chain integration (SCI) practices in a developing country textile supplier firms, i.e., Pakistan. The study also aims to explore the impact of these barriers on firm environmental performance (EPR), operational performance (OPR), and financial performance (FNPR). A conceptual model is proposed, and data are collected through a structured questionnaire from managers of Pakistani textile firms. The hypotheses are tested through partial least squares structural equation modeling (PLS-SEM 3). Findings indicate that high initial cost and lack of adequate environmental laws and standards are the main hindrances. Sustainability barriers directly impact the adoption of EMPs while indirectly affect firm performance. Direct effects also show a positive relationship of EMPs and SCI with firm performance. The impact of barriers on SCI and financial performance was not found significant. The study provides important insights about the key issues on the way to achieve sustainable supply chains in the textile sector of developing economies in South Asia. Efforts should be made to minimize the initial investment required for sustainability initiatives and country-specific customized standards should be introduced with stricter regulatory control systems. If these hurdles are mitigated, sustainability can bring positive change in supplier firms' performance as well as in the globally fragmented textile industry supply chains which can be a major step towards the SDG-12 and 2030 agenda.

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Sciforum-047433: Sustainable financial risk modelling: the case of Solvency II

Christian Pierre WALTER

[1] Fondation Maison des sciences de l'homme
[2] Kedge Business School

This technical note is a piece for contributing to the sustainable European stake in order to interlock financial systems with the objectives of the 2030 Agenda (the UN's SDGs). It is intended to be used as a platform for discussion between risk management practitioners in the financial industry and the regulator, as well as operators and scholars who have already these methods in other disciplines.
It is argued that the core problem with neoclassical finance short-termism is its underlying morphology of randomness. The argument makes a detour via philosophy of science, exhibiting the Leibniz "principle of continuity": change is continuous. It is argued that short-termism is the visible result of the choice of continuous randomness, the Brownian representation, itself the outcome of the principle of continuity. The principle of continuity trickled down into all of neoclassical economic thought, which was the source of contemporary finance. The "Absence of Opportunity of Arbitrage" (AOA) which represents the intellectual cornerstone of the dominant contemporary financial approaches derives from the principle of continuity. The introduction of fair value valuation and the "market consistency" valuation in the Solvency II directive are results of the principle of continuity. The principle of continuity has overseen a general disqualification of traditional risk assessment methods, which used to be based on ad hoc analyses.
In its 2018 report, the High-Level Expert Group of the European Commission asked that consideration be given to "how Solvency II could be adapted to further facilitate long-term investments". The present note answers: by removing the principle of continuity from the epistemological background of risk models used in the technical contents of the Solvency II framework. Financial risk modelling will be sustainable if it removes the principle of continuity from the morphology of randomness. To put it differently, "think sustainability first" implies "think discontinuity first".

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Sciforum-048467: We Need to Talk about the Impact of Digital Capabilities on Sustainable Value Creation

Selma Oliveira[1, 2], Sandro Trento[3]

[1] Fluminense Federal University
[2] Fluminense Federal Unviersity
[3] University of Trento

Recent studies have advocated the impact of digital capabilities on firms' competitive performances. This paper examines the relevance of digital capabilities in the context of sustainable business performance of different fabrics in Italy. Empirical data were acquired through a recent survey of different sectors in PMEs. Spearman correlations were employed to examine the relationship between digital capability and sustainable business performance. By demonstrating this relationship, these companies can better focus their capabilities on identifing, acquiring, integrating, and coordinating their technologies to create economic, social, and environmental value for customers and other stakeholders. The results show digital capabilities as an enabler for the creation of sustainable value in SMEs, highlighting the relevance of detection and learning capabilities for the improvement of sustainable business in this category of companies.

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Abstracts

Session C. Climate

Posters' abstracts

Sciforum-030965: Risk governance for peat land management for climate mitigation: A case study in South Sumatra

Ibnu Budiman

[1] World Resources Institute Indonesia

After the devastating fires in 2015, the Government of Indonesia (GoI) established a peatland restoration program to restore about two million ha of degraded peatland in seven provinces in Indonesia. However, governance issues are identified on the management of restoration program where there is lack of substantial coordination among key institutions and dominated by administration works (Kartodihardjo et al., 2018). It causes ineffectiveness of restoration output that increases peat vulnerability to fires.

This research aims at understanding (historical) vulnerability within the governance cycle of peatland management (particularly restoration) and introducing a risk governance framework to increase the effectiveness of the governance of peatland management. A case study of South Sumatra province is utilized. This research draws on spatial, qualitative, and quantitative data from interviews with key stakeholders; direct observation; academic literature; experimental modeling; open data platform, and document review from policy and project reports.

This study found that peatland restoration has been started in South Sumatra from 2002 after the 1997 fires, way before the official restoration program by the GoI in 2016. The restoration project was conducted in Muba, Banyuasin, and OKI regency by NGOs and research institute, without scale up by the government. The fragmented restoration was occurred at the same time with massive peatland conversion to palm oil plantation. This political vulnerability contributed to result in fires in about 150,000 ha peatland. The governance improvement on peatland management is identified after the establishment of peatland restoration program in 2016. With more resources, the government conducted risk assessment and risk evaluation before implementing restoration activities. Yet, not all this planning was implemented well. Absence of supported institutional arrangement and ecosystem/KHG approach, peat data accuracy, and lacking standard enforcement caused low output to restoration. In addition, technological issues, wrong target group, a lack of integration on restoration activities added more political vulnerabilities in restoration programs. As a result, several restoration activities were not done in peat area, one out of five infrastructures are dysfunctional, activities overlapped, and not resulting a positive outcome. About 95% of peatland restoration areas have low water table, average -0.9 m. From September to October 2019, 6400 hotspots are found on peatland, including on restoration area. These fires emitted 0.14 x 10^{15}-gram C. It does not imply a positive indication for impact of peatland restoration for climate mitigation. We argue that current governance model of peatland restoration is still not be able to fully stop the cycle of peat vulnerability (that causes recurrent fires), shortly. Governance issue lays on the unit of restoration activity that is not yet implemented based on KHG or ecosystem approach.

The implementation of restoration must use an ecosystem approach that considers the intercorrelation of biophysics and socio-economic aspects within the peatland ecosystem. This implementation can be done using risk governance framework, with these following steps:

- Establishing an institutional arrangement per KHG and across KHG;
- Risk re-assessment: Peat data need to be updated in real time based on the last fires events to prioritize vulnerable peatland to be restored;
- Prepare a detailed integrated restoration plan as risk management;

- The result of that detailed planning then must be evaluated, involving local stakeholders;
- Implementing the integrated ecosystem restoration, with standard enforcement to implementation of restoration activities to be a benchmark;
- Participative monitoring and evaluation;
- Throughout the processes:
    - Policymakers must have stable political will, considering different strategic-institutional arrangement in different organizations, conducting knowledge transfer management, and respecting cultural sensitivity in different locations;
    - All stakeholders must pay attention to communication strategy: specify potential risks, simplify message, anticipate different interests;
    - Understanding multi-stakeholders' perception toward peatland ecosystem governance and peatland hydrological unit.

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Sciforum-047672: Discussion on the carbon emission, population, and economy in East Asia area

Yan Zhou[1, 2, 3], Hongting Wang[4]

[1] Environmental Development Center of the Ministry of Ecology and Environment of China
[2] Sino-Japan Friendship Center for Environmental Protection
[3] Graduate School of Global Environmental Studies, Sophia University
[4] Beijing Agricultural Environmental Monitoring Station

Recently, climate change has become the hottest topic in the world. Studying policies related to population, economy, and carbon emissions have become an important issue that policymakers need to consider. As one of the most populated regions in the world, East Asia should make more regional contributions to climate change for the world. Facing this situation, this paper discusses the relationship between population and economy, the impact on CO2 emission from the population, and the potential impact from the lifestyle change. Finally, this paper gives some suggestions for the East Asia countries to fight for climate change from the perspective of population.

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Sciforum-031069: Building construction and its potential to contribute to climate change

Adriana Estokova, Martina Wolfova, Marcela Ondova

[1] Technical University of Kosice, Faculty of Civil Engineering, Institute of Environmental Engineering

Human activity and the associated greenhouse gas emissions (GHG) are responsible for a significant contribution to climate change. The construction and operation of buildings directly affect not only human health through the materials used but also contribute to the pollution of the environment and exhausting sources of the raw materials. The negative impacts of the building sector are also closely connected to climate change through the production of huge amounts of greenhouse gases. AS the building sector has evolved, CO_2 emissions in recent years have increased. One of the options for reducing CO_2 emissions in the building industry is to select the appropriate environmentally suitable materials with less negative environmental impacts.
This paper presents a case study that evaluates the GHG emissions related to wall constructions. Thirty-six material alternatives for bearing walls with the same thermo-technical parameters were selected to be compared in order to find the wall material composition with the lowest environmental load. The wall core materials consisted of perforated ceramic bricks of various thicknesses (300, 380, and 440 mm) and densities (760, 800, 830, and 1000 kg/m^3) in combination with different insulation materials (expanded polystyrene, polystyrene with graphite, and rock wool). GHG emissions were identified using the SimaPro software and Greenhouse Gas Protocol method. The environmental analysis included four categories: emissions from fossil sources, emissions from biogenic sources, and emissions from land transformation and CO_2 uptake. The average greenhouse gas emissions related to the wall constructions were 210.0 and 3.96 kg $CO_{2\ eq}$, respectively, for fossil and biogenic CO_2. The best environmental performance in terms of both fossil fuel (145.2 kg $CO_{2\ eq}$) and biogenic CO_2 (2.3 kg $CO_{2\ eq}$) emissions was obtained for the material alternative, which consisted of 300 mm thick brick, 1250 mm thick graphite polystyrene insulation, lime–cement interior plaster, and silicate outdoor plaster. The worst composition of wall material reached score twice as high of 268.0 kg $CO_{2\ eq}$ for fossil fuel and 5.8 kg $CO_{2\ eq}$ for biogenic emissions. The results showed a significant, almost twofold, difference between the best and worst alternatives.

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Sciforum-048324: Historical evaluation of heat waves between 2007-2020 for the city of São Paulo in Brazil

Rodrigo Rudge Ramos Ribeiro

[1] Getulio Vargas Foundation

Over the past 50 years we have experienced more heat waves (HWs) than previously. Many studies indicated that these unprecedented weather extremes are likely to increase in the future. The length, frequency, and intensity of HWs are expect to increase due to climate change. The HWs pose a substantial risk to human health, especially for outdoor activities like agricultural and construction workers exposed to extreme weather conditions. Currently, there are numerous studies in Europe regarding characterizing the HWs and evaluating their impacts however, similar analysis is lacking for Brazil

In 2020, Brazil experienced extreme temperatures, with a historical national record of 44.5°C and the second-highest temperature in São Paulo with 37.4°C, after the record of 37.8°C in 2014. The goal of this study is to provide a historical analysis of HWs occurrence for the Brazilian city of São Paulo, using historical meteorological data. Some research studies indicate the city of São Paulo, as one of the Brazilian city most affected by HWs, besides is the largest city with close to 12.3 million inhabitants.

The method is based on quantitative data using historical temperature records from 2007 to 2020. The historical data consist of daily values of maximum temperature obtained at the National Meteorological Institute (IMNET) of Brazil for the meteorological station in São Paulo A701 (Latitude: -23.496294º; Longitude: -46.620088º). The count of historic HWs event-days was count as the number of a sequence of five or more consecutive hot days, during which the daily maximum temperature exceeds the average maximum air temperature by 5°C, according to the HWs definition from the World Meteorological Organization.

In general, results indicate a total of 191 days of HWs with a tendency to increase for São Paulo. In 2014, the longest period was recorded with 20 days during January (average temperature of 22.1°C), and in 2015 with the HWs with the highest temperature of 34.8°C. During 2020, two HWs were registered: the first with a five-day duration in September, with an average temperature of 22.4°C, and the second with a six-day duration during November with an average temperature of 32.4°C. Finally, although 2020 was a record year in Brazil, it was not the year with the most days of HWs or with the highest HWs temperature in São Paulo.

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Sciforum-048400: Intergative Approach of Green Infrastructure and Urban Adaptation Planning in the City of Skopje, North Macedonia

Assoc. Prof. Dr. Viktorija Mangaroska[1], Prof. Dr. Kosta Mangaroski[2]

[1] Faculty of Architecture, IBU University
[2] Faculty of Architecture, SS Cyril and Methodius University, N. Macedonia

Abstract
Urban planners need to plan and create more sustainable and resilient communities, make a plan for climate adaptation, preserve and create green space, adopt green building policies, engage the community in climate change planning process, and approach climate change planning on a regional level. Urban climate is facing many challenges, such as urban heat island, air pollution and climate change, extreme and unpredicted weather storms, social and economic impacts, freshwater and food insecurity, etc. The effects of climate change are starting to show, with rising temperatures, increased precipitation, and sea-level rise, that become risks to the landscape of cities. These urban climate change effects need to be tackled by urban climate adaptation services.
The methodology approach in this scientific paper focuses on defining the measures for risk management and vulnerability of the urban climate, overcoming urban adaptive capacity aspects and creating urban climate adaptation planning that will be factor for sustainable development in the cities with special emphasis of city of Skopje, urban climate adaptation strategies in North Macedonia, greening strategies, and green infrastructure in the city of Skopje. The expected outcome results in this scientific paper is creating urban climate mitigation and adaptation planning that will focus on the complexity of the cities: energy supply, transport, buildings, energy demand, low-carbon technologies. Targets for urban mitigation of carbon dioxide emissions are now urgent and imply reconfiguration of urban energy systems, transport and the built environment. Urban adaptation of cities requires integrated thinking that encompasses a whole range of urban functions.
Effective adaptation and mitigation planning demands clear metrics of success, a protocol to identify, and construct policy levers, and tools for enhancing social and ecological capacities. Conceptualizing urban areas as sets of intersecting systems provides the basis to study the structure and organization of urban systems.

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Sciforum-047946: Mangrove blue carbon science for climate change mitigation and adaptation

Ahalya Arulnayagam[1, 2], Jinsoon Park[2], Jong Seong Khim[3]

[1] Department of Coastal and Marine Resources Management, Ocean University of Sri Lanka, Colombo, Sri Lanka
[2] Department of Convergence Study on the Ocean Science and Technology, Korea Maritime and Ocean University, Busan, Republic of Korea
[3] School of Earth and Environmental Sciences & Research Institute of Oceanography, Seoul National University, Seoul, Republic of Korea

Globally, there is a growing consensus that mangrove carbon can help ameliorate the impact of climate change. In the present study, we quantified the blue carbon capacity of eight natural mangrove stands on the Sri Lankan coast. We employed a combination of allometry for floral carbon and sediment core extraction for sediment carbon assessment. Species were identified and measured diameter at breast height (DBH) along a 10 m wide belt transect at six stations in each site (n=48), we extracted sediment cores at the points to measure sediment carbon, up to a depth of 45 cm and subsampled at 15 cm each. Floral carbon calculated with allometry while sediment organic carbon measured and analyzed with an elemental analyzer. Total ecosystem carbon (TEC) stocks significantly differed between sites (p0.05) with the highest in Rekawa (1247.28 MgC ha^{-1}) and the lowest in Mannar (307.82 MgC ha^{-1}). On average, sediment carbon stock was 89% of the total carbon while a higher proportion of the rest was aboveground biomass. If disturbed by means of land-use changes, they could emit an equivalent 2584.13 ± 1061.23Mg ha^{-1} of carbon dioxide. Key results from the present study would facilitate policymakers to include mangrove conservation into the climate mitigation agenda on a national scale.

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Sciforum-031854: Optimization for Construction Sustainable Design through New Digital Technologies

Clara Vite, Renata Morbiducci

[1] University of Genoa, Polytechnic School, Department of Architecture and Design (DAD)

More than thirty years after the definition of the concept of sustainable development, Agenda 2030 renews the commitment to protect the planet and to support the needs of generations present and future. All sectors of human activity are called upon to make their contribution to this significant challenge of our time. Due to its implications, the construction sector can make an essential contribution. In a future context where resources are limited, designers need to take environmental impacts into account throughout the whole life cycle. Although there are many tools to do this, they are often used after the design phase, when the possibilities for further modifications are drastically limited. We argue that a substantial transformation is required to change this situation. The digital revolution could be a suitable opportunity for a profound renewal oriented towards sustainability. The new digital technologies and the increased computing power are useful to manage the increasing complexity in current projects and to support collaboration between the many experts involved.
The presented research focuses on investigating the transformations in the construction industry and investigating how these changes can contribute to generating new processes and behaviors in sustainable design. The research aim is to imagine possible virtuous complicity between sustainability, digitization, and optimization. The study of the literature references, the discussion with experts, and the implementations realized using the newest tools available, have led to the definition of a replicable procedure for the optimization of the construction design process. It can be a support for designers to make design choices with a greater awareness of final impacts. It can also help to include sustainability from the very beginning of the design concept, changing the current practice where 'sustainability comes later'. The presented procedure is intended to be a building block in the advancement of research towards achieving sustainability goals in the construction sector.

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Sciforum-030852: Trends in Climate, River Discharge, Wind, and Dust Storms in Helmand River Basin of Afghanistan Over the Few Past Decades

Noor Ahmad Akhundzadah

[1] Faculty of Environment, University of Kabul

Abstract
The Helmand River Basin is the largest of the five river basins of Afghanistan. The basin is located in the arid southern part of the country close to arid Southwestern Asia. The Helmand River and its tributaries drain into the Hamoun lakes at the border with Iran. Many communities live along the river, and its water resources have been their means of livelihood throughout history. Among the River Basins in Afghanistan, the Helmand River Basin is extremely vulnerable to climate change. Most of the downstream area of the Basin, called the Helmand Basin, is desert covered with sand dunes and is highly exposed to wind and sand storms. Changes in climate over the past few decades have gradually changed the hydrological conditions of the river basin. The decrease in precipitation in the river basin has reduced the volume of water, which in turn has reduced the amount of green cover. The increasing warming and drought conditions have deeply destroyed the ecosystems of the basin and exposed the area to wind and dust storms. Wind storms have increased atmospheric aerosols and PM_{10} concentration in and around the Helmand River Basin. These changes deeply impact the communities within the river basin. In this study, trends in climate (mean annual temperature, precipitation), river discharge, and frequency and severity of wind and dust storms over the past few decades are analyzed. Assuming that these trends continue, their impacts will be similar, if not worse, than already experienced. This study proposes two community-based surface water conservation and green cover expansion to mitigate these impacts.

Introduction

Afghanistan is among the most vulnerable countries to climate change due its low adaptive capacity and high exposure to climate fluctuation (Aich et al., 2017). The impacts of climate change have greatly affected water resources, agriculture, and ecosystems in all the five main river basins of the country (INDC, 2015; NEPA, 2017), deeply affecting the socioeconomics of the country. Impacts of global climate change have caused environmental degradation and climate-induced disasters, including wind and dust storms in the trans-boundary river basin (UNEP, 2003; World Bank, 2004). The Helmand River Basin is the largest of the five main river basins in the country and is the main focus of this study. The basin is located in the arid southern part of the country close to Southwestern Asia. While primarily arid, it has some productive agricultural regions along its river and tributaries (MEW, 2013). The Helmand River is a vital water resource in Southern Afghanistan and has supported desert civilizations in the Sistan depression for over 6000 years (Whitney, 2006). The Helmand River and its tributaries are also the main water resources in desert Southern Afghanistan and Eastern Iranian provinces. Surface water has declined as a consequence of decreased precipitation, in turn causing the reduction in vegetation cover and agriculture that expose the basin to drought, wind, and dust storms.

The impacts of climate change exacerbate the wind storms in many arid and semi-arid regions of the world (UN-ESCAP, 2018). The southern part of Afghanistan, especially the Helmand Basin and Sistan area around the Afghanistan-Iran border, is especially vulnerable to wind dust storms and wind deflation (Rashki et al., 2012). One of the most famous winds in Afghanistan, called the 120-day wind, blows strongest between June and September (Alizadeh-Choobari et al., 2014). The wind and dust storms have deep environmental implications, exacerbated in arid regions by recent changes in climate (see, e.g., Alam et al., 2014; Akhzari et al., 2014; Engelstaedter et al., 2003). In these arid regions, with a

decrease in precipitation, surface water is diminished, which directly negatively influences vegetation covers by increasing bare ground. This in turn exposes the land to desertification and increasing wind and dust storms (Sofue et al., 2018; Gong et al., 2004). Increases in wind and dust increase atmospheric aerosols, the accumulation of which affects the global climatic system and has strong health impacts (Myhre, et al., 2013; Goosse, 2015). Airborne particulate matter (PM) has impacts on attenuating the solar radiation to the ground, modifying the solar spectrum, redistributing the earth atmospheric budget, biogeochemical cycling in the ecosystem, visibility, and human health (Mahowald et al., 2005; Nriagu and Pacyna, 1988; Husar, Prospero and Stowe, 1997; Cheng et al., 2009).

Therefore, with 80 percent of Afghanistan's population relying on agriculture for their livelihoods (World Bank, 2004, and Yildiz, 2015), a decline in water resources increases the socioeconomic vulnerability and decreases the resilience of the River Basin (UNEP, 2008). On the other hand, the Helmand River Basins have good potential for water resource development and management for ecosystem restoration and climate change mitigation through adaptation of Integrated Water Resources Management (IWRM, 2000) and Community-Based Approaches (Lauber et al, 2008; Soeftestad, 2001). These methods are people-centered approaches to the integration of conservation and development of natural resources and water to overcome poverty, hunger, and disaster. Therefore, the implementation of these approaches will greatly influence environmental recovery, climate change mitigation, and disaster management. This collectively will improve the socioeconomics and livelihoods of the people within the river basin.

Methodology

In this study, the main focus was on assessing the recent changes in climate (precipitation and warming) on the surface water resources of the Helmand River Basins and the frequency and intensity of wind and dust storms. For climate change impact assessment, historical hydrometeorological data are used to identify the historical change in surface fwater, temperature rise, and wind storm potential.

Results

Results of existing data analysis demonstrate a gradual increase in the mean annual temperature and wind storm, while precipitation and river discharge demonstrate a gradually decrease. In addition, there is a huge change in the land cover due to the impacts of climate change and the associated environmental degradation in the Helmand River Basin. The above-mentioned climate change and environmental issues have deeply affected the livelihood and well-being of the communities within the river basins in terms of water, agriculture, and ecosystem life. The most profound impact of climate change is investigated within the Helmand Basin in the downstream area of the river basin.

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Sciforum-047789: Urban Malaysia and the Anthropocene: Exploring Citizen Participation for Climate Change Adaptation and Mitigation

Mufaro Chitsa, Subarna Sivapalan

[1] Universiti Teknologi PETRONAS

Climate change continues to be a threat which requires urgent intervention at local and global levels. Communities at all levels have been greatly impacted by the effects of climate change. The need to get citizens aware of the impacts of climate change has since become a critical call for action, with nations the world over allocating funding and budgets to conduct climate change advocacy, education, and awareness initiatives. Although there is much discussion in the literature on the role governments play in driving climate resilience, what seems to be lacking, within the Malaysian context particularly, is the role of citizens in climate policy development to effect positive change for climate change adaptation and mitigation efforts. Underpinned by the Theory of Planned Behavior and the Transtheoretical Theory, this study focuses on how citizen participation can be used as a mechanism to adapt and mitigate climate change within the urban Malaysian context. The study explores citizen perceptions and attitudes towards climate change, adaptation and mitigation, and the extent to which citizen participation in climate policy development processes could impact upon their adaptation and mitigation efforts. Results from a nationwide survey and interviews with NGOs, climate experts, and relevant government bodies are discussed in this presentation. The findings from this study will be useful to policy makers, local councils, and the relevant government bodies to ascertain how best they can mobilize citizens towards successful climate resilience within the Malaysian urban context.

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Selected talks

Sciforum-030886: The relation between urban metabolism and circular city: a literature review

Mariarosaria Angrisano[1], Antonia Gravagnuolo[2]

[1] Pegaso University Naples, Italy
[2] Institute for Research on Innovation and Services for Development (IRISS) National Research Council, Italy (CNR)

The "circular city" is interpreted as the regenerative and self-sustainable city that finds its foundation in the territorial and spatial dimension of the circular economy. It is the city that recycles resources, focusing on the materials life cycle, recovering all wastes as a resource for new production cycles. A city is circular when it enhances environmental quality through the rational use of energy, the enhancement of green areas, effective water recycling systems. Nowadays, there are different sectors in which the cities invest to transition towards "circularity". The circular city is interpreted as the "metabolic city", which uses all the waste it produces as its new fuel. The metaphor of urban metabolism has been widely used to describe cities and urban systems as organisms that need resources (as inputs) to sustain their activities and all kinds of waste and pollution (negative outputs) as externalities of transformation processes (www.planningclimatechange.org). The aim of this paper is to review an analysis of the existing scientific literature about the relation between urban metabolism, circular economy, and circular cities. This study will be conducted through a comparative analysis of the circular cities which already adopting urban regeneration strategies based on urban metabolism, with the aim to identify the tools, the guidelines and the indicators to build and monitor the metabolic urban planning. A particular attention will be focused to the "built environment sector" as a micro-sector, capable of powering the "urban organism".

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Sciforum-031950: A Multi-interdisciplinary Approach to Achieve the Sustainable Development Goals—The Pathway to Sustainable Cities and Communities in Austria

Marco Scherz, Helmuth Kreiner, Alexander Passer

[1] Working Group Sustainable Construction - Institute of Technology and Testing of Construction Materials - Graz University of Technology

Background: Building on the Millennium Development Goals (MDGs), at the UN Summit in New York in September 2015, all member states committed themselves to working towards the implementation of the 17 Sustainable Development Goals (SDGs) at international, national, and regional levels by 2030 (Agenda 2030). In Austria, all federal ministries were committed to the coherent implementation of the UN Agenda 2030 and the SDGs. As central institutions for education and innovation, universities have a major role to play in the implementation of Agenda 2030 and the SDGs. Therefore, the UniNEtZ project (a collaboration of 17 Austrian universities and partner institutions) is elaborating scientific-based options on how the 17 SDGs could be implemented in Austria. This new approach shall forward interdisciplinary networking and cooperation between universities, a joint identification of research needs and options for action, and the anchoring of sustainability in teaching from a more holistic point of view.
Goals: The aim is to prepare an options report that identifies and evaluates future-oriented options for action to support the implementation strategy by the federal ministries. In line with the work of the Intergovernmental Panel on Climate Change (IPCC), this involves policy-relevant proposals, but not policy-prescribing options. The developed options should be set by decision makers in Austria in order to contribute to the achievement of SDGs in Austria and beyond.
Methodology: In order to ensure politically feasible options, the state of the art of the individual SDGs' implementation in Austria is described. For this purpose, systematic literature research (SLR) and expert workshops were conducted. In order to be able to look beyond the edge of our field, a systemic approach is indispensable to fulfill interdisciplinary cooperation needs. In addition to the creation of system maps for system analyses using different system dynamics methods, for SDG 11 “Sustainable cities and communities", the “know-why” method is applied in order to transparently visualize and highlight synergies and trade-offs of the developed options.
Results: Using a systemic approach should support federal ministries in the decision-making process. Science-based options based on a holistic point of view will provide valuable impact in order to achieve Austria's Agenda 2030 goals. The specific aim is to show how options can be implemented in practice and what effects they have in a short, medium, and long-term perspective. In addition, the question must be answered whether one individual proposed option will bring the desired results or whether so-called “option packages” are required. This article presents the methods applied, an example-option of SDG 11 as well as its effects on other SDGs.

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Sciforum-047516: Adapting cities to climate change: case study of international experience in Jean Monnet Project CLEUX

Nina Danilina

[1] Moscow state university of civil engineering, Russia

The study is devoted to the issue of urban areas adaptation to climate change addressed to the achievement of Sustainable Development Goals #11 and #13. For Russia, the issue of climate change is of scientific interest, which is associated with the location of the territory in different climatic conditions and zones. This also determines the complexity of taking into account all the consequences and the need to develop comprehensive universal solutions for the adaptation of urban areas. The main idea of the study is to propose a systematic approach to climate change adaptation in urban planning starting from the authorities level and ending with urban design solutions. The first step is the overview of the international experience how to provide this question in urban planning policy. For Russia, the problem is that at present this type of activity is not included in the official documents of urban planning, as it is implemented in European countries. Next, there is the an approach to the land use assessment for green framework development, as one of the ways to adapt territories to climate change and implement the green agenda. The results of research are conducted for the south cities of the Krasnodar region in Russia to identify the problem of green corridors in terms of access, connectivity, and diversity. The study is conducted as part of the Jean Monnet Modules project " Climate change and urban planning: European experience (CLEUX)".

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Sciforum-048343: Carbon Footprint Estimates for the Grid-tied Nigerian Power Sector

Godwin Obi, Chisomebi Onwunyi, Howard Njoku, Chinwendu Egbuhuzor, Mtamabari Torbira

[1] University of Nigeria, Nsukka

Accurate quantification of greenhouse gas (GHG) emissions from specific activities (carbon footprint) is critical to national and international efforts towards climate change mitigation.
This research evaluated the carbon footprint of Nigeria's power sector using the IPCC's tier 2 approach. Earlier estimations were based on the tier 1 approach and provided in the data reported in Nigeria's first Biennial Update Report (BUR1) to the UNFCCC. Following the tier 2 approach, an estimation model was developed which related CO2 emissions with fuel consumption, fuel carbon content, and process oxidation factors. For plants without reported values of fuel consumption, the model also provided a means of estimating such values using data, including plant thermal efficiency, fuel calorific value, and annual energy generation. For validation purposes, estimations were compared with GHG emissions data obtained from plant reports. Emissions from 23 power stations were estimated for the years 2016 to 2020 to obtain maximum, minimum, average, total and percentage emissions contribution from each station. Further analysis of the CO2 emissions results revealed that close cycle gas turbine plants generally had less emissions per unit energy output than open cycle plants. On the national scale, total annual emissions increased from year to year between 2016 to 2020 from 13.85 MMT to 18.7 MMT, respectively. This trend was expectedly in parallel with plant energy production which increased from 20.38 million MWh to 27.26 million MWh for the years considered, since increased power generation demands were not being met by renewable energy technologies.
Emissions projections also disclosed a potential 129MMT CO2 emissions reduction and USD 1 billion carbon tax reduction if Nigeria's 40,000MW power generation demand was achieved using renewables.

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Sciforum-031276: Data-driven analysis of climate change in Saudi Arabia over the last four decades

Natalia Odnoletkova, Tadeusz Patzek

[1] King Abdullah University of Science and Technology

We have analyzed the long-term temperature trends and extreme temperature events in Saudi Arabia between 1979 and 2019. Our study relies on the high resolution, consistent, and complete ERA5 ECMWF reanalysis data. We have evaluated linear trends in several climate descriptors, including temperature, humidity, heat index, and extreme event indices. Previous works on this topic have used data of poor quality from weather station observations over limited time intervals. In addition, previous analyses exclude the recent years of temperature data. The decade of 2010-2019 has been the warmest decade ever observed by instrumental temperature monitoring, and comprises the top eight warmest years. Thus, the previous results may be misleading and invalid, and cannot be relied on. Our findings indicate that over the past four decades Saudi Arabia has heated up at the rate that is 50% higher than the rest of land mass in the Northern Hemisphere. In addition, the moisture content of the air has significantly increased in the region. The increases of temperatures and humidity have resulted in the soaring of dew point temperature and heat index across the country. Of high importance is that these increases are stronger during summers, which are already very hot, rather than winters. Such changes may be dangerous for people over the vast areas of the country. If the current trend persists in the future, human survival in the region may be impossible without continuous access to air conditioning.

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Sciforum-048289: Ecological interactions and impact of biological control agents of aquatic invasive plants under changing climatic conditions

Puja Ray

[1] Presidency University, Kolkata, India

Climate change and biological invasions are two of the most persistent ongoing challenges today. Prediction of climate change impacts on ecosystem and its functioning becomes a challenging problem due to scientific uncertainties. These uncertainties arise as climate change and biological invasions interact with other existing stressors to shape the distribution, spread, diversity, and abundance of species, substantially altering biodiversity, causing changes in phenology, genetic composition, species ranges, species interactions, and ecosystem processes. Invasive aquatic plants, such as water hyacinth, alligator weed, giant salvinia, etc., often grow aggressively causing significant ecological and socio-economic impacts. Biological control of invasive species with host specific insects and plant pathogens is considered a cost-effective, permanent and environmentally friendly method. But on one hand where climate change is anticipated to benefit the invasive plant species, on the other hand how this will impact the biological control agents and the control mechanism is less known. Biological control in an aquatic ecosystem is largely influenced by highly eutrophic waters, cooler climates that slow the build-up of the biological control agent populations, frost, floods and inappropriate application of other control methods, such as herbicide application, that affect the agents or cause a reduction in the weed population thereby decimating the agent population. Elevated CO_2 and temperature, together with phytopathogenic infection or arthropod herbivory, can significantly modify plant biochemistry and, hence, plant defence responses. Similarly, the field performance of a microbial herbicide in terms of virulence, host-range, etc., depends on several biological traits of the organism and its environmental conditions. There is a greater need to examine approaches for predicting the invasiveness of non-native plants and their biocontrol agents, under changing environmental conditions and their ecological interactions and impacts. There is also a critical need for a wider study of ecological, behavioural, physiological and life-history responses to be addressed across a greater range of geographic locations, particularly in areas of high human population growth and habitat modification, like India. This paper reviews how modified interactions, between mutually interacting species, like spatial or phenological decoupling of herbivore-predator, host-parasite or plant-pollinator populations, etc., may have ecological and economic consequences globally in aquatic invasive species and their biocontrol agents under changing climatic conditions.

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Abstracts

Session HM. Health and Medicine

Posters' abstracts

Sciforum-048514: UrJourney: mobile application for wellbeing monitoring

Raquel Sebastião[1], Jorge Silva[2], Ilídio Oliveira[1]

[1] IEETA/DETI, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
[2] DETI, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

The evolution of mobile devices and their increasingly prominent presence creates opportunities for their use in healthcare applications. Therefore, mobile devices are increasingly used for the voluntary collection of physiological data, for personal use, or to support remote healthcare. In general, they are increasingly used to self-monitor the individual's health and wellbeing status.
For a more detailed understanding of the individual's wellbeing, the proposed application accounts the integration of self-reported data regarding wellbeing factors with physiological data collected by a wristband sensor. This mobile application, called UrJourney, for Android systems, supports the design of studies related to the welfare of participants. These studies account for an objective component (through the collection of self-monitoring data), and a subjective data component, obtained by self-records of how the individual feels. The system is also composed of a study management platform, through which the self-monitoring data collected is analyzed. The mobile application and the study management platform are designed and implemented as proofs of concept.
Data collected during a pilot study, with 9 participants (32±14y.o.), allow analyzing the relationship between subjective data with objective data, establishing patterns on habits related to wellbeing and comparisons between intra- and inter-participants habits.

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Sciforum-047929: An Approach for the Detection and Classification of Bone tTumor Using Convolutional Neural Network

Dr G Manjula

[1] Dayananda Sagar Academy of Technology and Management
[2] DSATM,Bengaluru

Cancer may be a dangerous disease among different sorts of diseases. Almost 70% of individuals will be suffering from some type of cancer. Bone cancer may be a reason for major death among all sorts of cancers. Bone cancer is additionally known as bone neoplasm or a bone tumor. First, we need to focus on the affected part and stage of disease by using medical imaging techniques, such as X-ray, CT, PET scan, accurately. The primary step is to preprocess the image using median filter as the scanned images does not contain high resolution because of the total number of slices per pixel and noise.
Then, specific features are chosen using genetic algorithm and extracted using GLCM from the preprocessed images. The CNN is used to classify the extracted images and storing purpose, this classification is useful to identify the stage of disease which helps physician to give remedial suggestions. 95%–98% of accuracy can be achieved using proposed methodology.

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Sciforum-034044: Green extractions and sustainable technologies in the Finnover project: health-promoting compounds from Castanea spp. bud-derivatives

Dario Donno[1, 2], Federica Turrini[3], Raffaella Boggia[3], Maddalena Guido[4], Massimo Grilli[3], Anna Pittaluga[3], Maria Gabriella Mellano[2, 5], Gabriele Loris Beccaro[2, 5]

[1] Department of Agriculture, Forestry and Food Science, University of Torino, Italy
[2] Chestnut R&D Center, Chiusa Pesio (CN), Italy
[3] Department of Pharmacy – DIFAR, University of Genoa, Italy
[4] Azienda Agricola Geal Pharma, Bricherasio (TO), Italy
[5] Department of Agriculture, Forestry and Food Science – DISAFA, University of Torino, Italy

Green economy is a sustainable tool for the development and valorisation of natural, social, and economic resources. It is recognized as a tool to produce goods and services, as well as for the sustainable conservation and use of natural resources. The FINNOVER project ("Innovative strategies for the development of cross-border green supply chains") proposes a technical-economic path for the creation, development, and valorization of new supply chains for the eco-sustainable extraction and use of natural health-promoting compounds. In this study, an innovative "green" extraction strategy to produce healthy value-added products derived from herbal preparation by-products was developed as an alternative to traditional waste incineration or composting. *Castanea* spp. has been selected as a case study because it was widely used for hundreds of years as medicinal plants in composite formulae, but this approach could be analogously applied for other herbal extracts. Bioactive compounds (botanicals) are quite variable in the raw material, based on genotype (intraspecific chemodiversity), different collection stages, pedoclimatic conditions of sampling sites (wild or cultivation zones), agrotechniques, and post-harvest handling. This research aimed to compare the pattern of health-promoting agents in *Castanea* spp. bud-derivatives (herbal preparations derived from meristematic fresh plant tissues as buds and sprouts) with the composition of extracts derived from the bud-waste management process. Molecules were extracted by the encoded traditional method (maceration in hydroglyceroalcoholic solution) and by innovative sustainable extraction technologies (pulsed ultrasound-assisted extraction). HPLC methods were used to characterize the main bioactive compounds, and to obtain a specific profile to assess the contribution of each botanical class to the total phytocomplex. About the 13% of the *C. sativa* bud-derivative phytochemical content was preserved in the marc extracts and it could be recovered for further products. Cinnamic acids, vitamin C, and flavonols resulted as the most preserved classes of compounds in the marc extract after PUAE application. These results are very important because of the protective effects of polyphenols and vitamin C mainly ascribed to their antioxidant and anti-inflammatory capacities. The established protocol was simple, sensitive, and reliable, and it may be used for the evaluation of natural products and eco-sustainable preparations. The valorization of bud marcs, derived from the bud-derivative production, could be a very important re-use strategy and show a significant economic impact for the commercial producers, representing an important innovation in this sector.

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Sciforum-048339: Harmonization on the urban environment development linked to sustainability and population health

Edna L. Negrón-Martínez

[1] University of Puerto Rico Medical Sciences Campus, San Juan, Puerto Rico

The world's urban population densities have increased rapidly over the past six decades. Urban living has a crucial impact on people's health and well-being. However, rapid and unplanned urban growth can also threaten sustainable development when the necessary infrastructure is not well-developed or when policies are under-evaluated after their implementation. This study followed a systematic review of the literature to assess linkages and initiatives between environmental sustainability and its effect on the ecosystems and people's health.
Continued increases in urbanization are driving more exposure to air pollution, water shortages, and waste-related risks of the population. The high population density in most cities accounts for more than 70% of global greenhouse gas emissions because of their heavy use of non-renewable energy, primarily transportation, building workload, and industrial settings. Cities can also be particularly vulnerable to climate change influences as the urban heat island effect and increased coastal flooding due to rising sea levels.
The economic sustainability crisis reveals that a strong per capita gross national product (GDP) indicator does not necessarily indicate that an economy is 'healthy' or that the quality of life for individuals is improving. Even though growth in GDP per capita is a critical driver of average household disposable income, it does not provide policymakers with a sufficiently detailed picture of other indicators of progress like human development and human living costs, among other factors.
Health is the determining attribute of human development in a universal and inclusive pathway. The 2030 SDGs emphasize that social, economic, and environmental factors influence human health and inequalities in health. Consequently, broadening the adoption of sustainability actions across multi-sectorial and interconnected landscapes might improve the health of humans and our world ecosystems in the short, mid-, and long term.

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Sciforum-048356: Health policy strategies applicable to infectious disease outbreaks

Stefania Kerekes[1], Păun Nicolae[2], Abram Wagner[3]

[1] Fulbright Visiting Student Researcher at the University of Michigan, School of Public Health, Department of Epidemiology, Ann Arbor, USA; PhD Candidate at University of „Babeș-Bolyai", Faculty of European Studies, Cluj-Napoca, Romania
[2] University of „Babeș-Bolyai", Faculty of European Studies, Cluj-Napoca, Romania
[3] University of Michigan, School of Public Health, Department of Epidemiology, Ann Arbor, USA

Background
The purpose of developing this research topic is to analyze health policies globally, with a focus on the European Union. The current health crisis has highlighted gaps in global health systems, forcing us to rethink existing health policies and to adapt them to the new socio-economic circumstances. Global leaders will need to rethink strategies and redistribute tasks in order to mitigate the spread of emerging infectious diseases.
Methods
To achieve the study purpose, we analyzed several documents from the EU and constituent countries. Within this analysis is an overview of global health governance and functioning of the European Union, highlighting the changing landscape of crisis management. Through this analysis, we discuss and assess best practices of pandemic management and identify shortcomings in health policies.
Results
We identified major steps that have to be implemented during an outbreak, such as having a clear strategy from the beginning and using working groups. To control the spread of the disease, non-pharmaceutical interventions, testing, contact tracing, and immunization strategies are all important. Investing in health policy-making and the training of professionals is crucial, in addition to maintaining an environment of global collaboration and information sharing.
Conclusion
Limiting the mass outbreak of an emerging infectious disease in the future will require a relatively high level of preparation for the actors involved. The current COVID-19 pandemic has highlighted large disparities between countries in their ability to counter an emerging infectious disease. Going forward, countries should have a more robust system of health policies in place.

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Sciforum-048035: How global health diplomacy can help healthcare professionals in the COVID-19 pandemic?

Jasna Karacic[1], Marin Viđak[2], Ana Marušić[2]

[1] International Council of the Patient Ombudsman
[2] Department of Research in Biomedicine and Health, University of Split School of Medicine, Split, Croatia

Introduction
Global health diplomacy (GHD) is a novel concept in health with a focus on the interactions in foreign affairs. Diplomacy traditionally refers to the representation of national interests amongst the international community and should bring protocols and instructions to healthcare professionals (HTP) on how to deal in the crisis COVID-19. The rule of GHD is to coordinate policy for improving global health. This study aimed to evaluate how GHD can help HTP.
Methods
We performed qualitative interviews with participants responsible for health in the EU as foreign governments and health-related non-government sectors through purposive sampling.
Our interviews in discussions with professionals responsible for health explored and identified the current situation and problems for the HTP dealing in practice and ethical and moral dilemmas to providing only emergency treatments and diagnostic in the hospital lockdown.
Results
We identified respective lessons that GHD can apply to help HTP.
Participants reported that this is a very difficult time for HTP, who have to balance the fear about their own safety with providing full care to their patients. HTP is faced with ethical and moral dilemmas about limiting access to healthcare and the risk of COVID-19. They had to choose between providing care or postponing the already scheduled diagnostic and therapy process but listen to the healthcare institutions' rules as well.
Most participants stressed the fact that HTP always needs to have national support and hospital support for decision making. COVID-19 transcends national boundaries and governments and calls for global action to determine the health of people.
Conclusion
Our findings indicate that understanding the needs of each patient locally brings together the best outcome of treatment and establishes a stronger relationship of trust between patients and health workers. Patient access to care is rebounding after the COVID-19 pandemic shutdown, suggesting that provider efforts to drive patient re-engagement during reopening have had a positive impact. To the HTP are essentials to have clear instructions from the GHD and establishing a clear protocol pathway is critical for the future and for fostering effective GDH outcomes.

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Sciforum-032538: How to achieve sustainable eating in the general population?

Christian Koeder[1], Sarah Husain[2], Ragna-Marie Kranz[2], Andreas Hahn[3], Heike Englert[2]

[1] Leibniz University Hannover, Germany; University of Applied Sciences Muenster, Germany
[2] University of Applied Sciences Muenster, Germany
[3] Leibniz University Hannover, Hannover, Germany

Introduction: Moving towards a more plant-based dietary pattern would likely be beneficial in terms of a variety of sustainability dimensions.
Methodology: We conducted a 2-year intervention study with six measurement time points (baseline, 10 weeks, 6 months, 1 year, 1½ years, 2 years) in rural northwest Germany. The intervention consisted of a lifestyle programme, and dietary recommendations were to move towards a healthy, plant-based diet. The control group received no intervention. Diet quality was assessed with the healthful plant-based diet index (hPDI).
Results: In the intervention group (n = 67), the 2-year trajectory of hPDI was significantly higher compared to control (n = 39; p 0.001; between-group difference: 5.7 (95% CI 4.0, 7.3) food portions/day; adjusted for baseline). The 2-year trajectory of meat intake was significantly lower in the intervention group (n = 79) compared to control (n = 40; p 0.001; between-group difference: -0.7 (95% CI -0.9, -0.5) portions/day; adjusted for baseline).
Conclusion: Our study confirms that plant-based nutrition education in the general population is likely to result in at least modest dietary improvements in terms of general healthfulness and meat reduction.

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Sciforum-031392: Impact of the COVID-19 Pandemic on Routine Child Immunization in Ghana

Kathrin Durizzo[1], Kenneth Harttgen[1], J. Koku Awoonor-Williams[2], Isabel Günther[1]

[1] Development Economics Group & Center for Development and Cooperation (NADEL), ETH Zurich, Clausiusstrasse 37, 8092 Zurich, Switzerland
[2] Ghana Health Service, Accra, Ghana

BACKGROUND: While several Low- and Middle-Income Countries (LMICs) aim to scale up the coverage of health insurance schemes to ensure Universal Health Coverage (UHC) – access to good quality services at affordable costs to everyone – the percentage of the population enrolled in insurances or other social health protection schemes is still low. In the scale-up of UHC, countries should consider that the expansion of enrolment with simultaneously rising health care costs can lead to unsustainable health care financing. Currently, little information is available from LMICs on the people enrolled in health insurance: the characteristics of members who use health services and how often they use it, what health services they use, where they seek health care, and what drives the cost structure of the claims.

METHODS: We analyze a large sample of 2,928,753 beneficiaries and 33,690,080 claims from the Tanzanian National Health Insurance Fund (NHIF) for one year. Logistic regression was used to examine factors predictive of whether a beneficiary had a claim or not, while ordinary least square (OLS) regression was used to study factors associated with the number of claims per beneficiary as well as the costs per claim.

RESULTS: The majority of NHIF beneficiaries in Tanzania still comprises of the primary target group, public employees (78.4%). The expansion of the scheme to the private and informal sector and vulnerable groups only accounts for a small number. On average, 40.6% of the beneficiaries had at least once claim within the year 2016, with great variation among the expanded member categories: retirees and members of parliament had significantly higher rates and vulnerable groups had extremely low rates. Children under 10, which have a high risk of death, had low uptake as well. This is surprising since several social protection programs target this vulnerable group, suggesting that more barriers than enrolment influence take-up. Most frequently claimed health services are medicines (e.g., pain killer, antibiotic, anti-malaria drugs), and the most expensive services are surgeries (e.g., cancer or heart-related). This is in line with some of the most prevalent diseases and top causes of death in Tanzania, such as malaria, tuberculosis, heart diseases, and neonatal disorders. Although more public as well as primary health care accredited health facilities exist, the most claims are coming from hospitals and private health facilities. This indicates that a strategy for scale-up of health insurance would require interventions to increase trust and quality in public health facilities, as well as an enhanced gate-keeping system. The financial value of total claims in 2016 was TZS 238,343 million (around USD 104 million) and the mean claim value was TZS 5,722 (around USD 2.5). The majority of the money flows into non-primary care (e.g., hospitals and clinics) and privately owned health facilities, which both contribute significantly to higher costs. Furthermore, females, individuals above 20 years old, and some extended member categories such as members of parliament, private individuals, and clerics generate considerably higher costs to the NHIF. The reasons for differences among member categories still need to be further explored.

CONTRIBUTION: This study uses beneficiaries, claims, and health facility data of the Tanzanian NHIF to analyze (i) who is insured under the NHIF scheme, (ii) who uses services and how often, (iii)

what kind of services are reimbursed, (iv) what kind of health facilities are used, and, finally (v) what are important factors contributing to the health services costs. We provide insights into the functioning of a national health insurance in a low-income country contributing to improve the understanding of the challenges of scaling up the NHIF coverage.

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Sciforum-048248: Mae Kampong community health and Miang culture in Thailand

Panchana Charaj[1], Piyatida Panitsupakamol[2], Tamonwan Chankaew[2], Chalermpong Saenjum[3, 4, 5], Dujrudee Chinwong[2, 6], Surarong Chinwong[2, 6]

[1] Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand
[2] Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand
[3] Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200
[4] The cluster of Excellence on Biodiversity-based Economic and Society (B.BES-CMU), Chiang Mai University, 50200, Thailand
[5] Research Center for Multidisciplinary Approaches to Miang, Chiang Mai University, Chiang Mai, 50200, Thailand
[6] The cluster of Excellence on Biodiversity-based Economic and Society (B.BES-CMU), Chiang Mai University, 50200, Thailand;

Fermented Assam tea leaf, also known as *Miang*, is one of the famous staple foods of the Mae Kampong community in northern Thailand. *Miang* cultivation and harvest methods require farmers' physical activity to walk across mountains, since Assam tea is grown in the hillside and highland forest with specific clean water and soil condition. Additionally, *Miang* has another health benefit which is energizing because it contains caffeine. Nevertheless, the studies on *Miang's* health benefits and using it as traditional medicines are limited. Therefore, this research aimed to study the relationship between *Miang* and the health of the Mae Kampong community. This cross-sectional and qualitative research was conducted in Mae Kampong village, Mae On District, Chiang Mai, Thailand. Mae Kampong villagers had performed physical activities daily by harvesting Assam tea. Even though it was not intentional, the physical activity of harvesting *Miang* had promoted Mae Kampong villagers' health. Furthermore, the locals chewed *Miang* to energize and power themselves through the day. The health benefits from *Miang's* medical properties are still ambiguous, and await further investigation. However, the Mae Kampong community had already discovered one of the health benefits, which was physical activities.

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Sciforum-048445: Newborn Parenting Education Program in Hospitals: A Framework for Sustainable Nurturing Childhood and Transgenerational Health

Shelina Bhamani[1], Mohsina Gujrati[2], Fatima Shafiq[1], Hijaan Mitha[2], Alyza Muhammad Ali[1], Lumaan Sheikh[1]

[1] Aga Khan University
[2] Aga Khan University Hospital

The first 1,000 days and early childhood development experiences have a lasting and transgenerational impact on overall health and wellness. The experiences, interactions, and nurturing provided during the first days of life have an enormous potential to shape the path of future development. Educating parents and caregivers about providing responsive care is essential for a child's holistic success. Early childhood caregivers should be informed about the basics of their child's health, breastfeeding techniques, activities to promote social and emotional growth, ideas for brain development, and school readiness skills. Information about evidence-based caregiving should be available to all parents, regardless of their socioeconomic or ethnic background. However, there is an enormous gap in education for parents and caregivers between high-income and lower-middle-income countries. The gap has widened with the COVID-19 pandemic, and parents of a young children have found it extremely challenging to find simple to apply and easy-to-understand evidence-based information pertinent child caregiving at home settings, and this parenting anxiety have been found in higher rates in the parents of newborns, specifically first-time parents. To address this, in Pakistan, at a tertiary care hospital, we initiated a program entitled 'Parenting Readiness Education Program PREP.' This paper presents a case study of one of the components of PREP, i.e., the Newborn Parenting Education Program (NBPEP). It further details comprehensive information relevant to its NBPEP program development, implementation, evaluation, family education service delivery rating, and health care provider experiences. Additionally, it highlights the key messages needed to scale up parenting programs for newborns and recommends how hospital systems could be strengthened into family-oriented health promotion hubs.

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Sciforum-048261: Public Health Governance: A Comparative Assessment on the Local Government Unit (LGU) Initiatives towards COVID-19 Vaccine Hesitancy Mitigation of the Cities of Cebu and Davao, Philippines

Harey Lyka Roseos, Mhar Guielle Cajigas, Nikka Macamay, Mary Che Vitor, Cristy Anne Junio, Ana Leah Cuizon

[1] University of the Philippines-Cebu

The COVID-19 pandemic will leave an indelible mark in history as the post-COVID-19 future can never proceed without vaccine immunization. Vaccines, albeit indispensable instruments that can assist in redeeming productive control and achieving herd immunity, are hindered by a threat to global health vis-à-vis health seeking behavior; such is the case on COVID-19 vaccine hesitancy. Time and again, studies point to the government having a significant role in vaccine hesitancy mitigation, vaccine acceptance, and public compliance. Owing to the decentralization of health services in the Philippines, this paper brings attention on the vaccine hesitancy of the residents from two first-class, highly urbanized cities of the Philippines, namely: Cebu City (Visayas Region) and Davao City (Mindanao Region), and their assessment on the local government unit (LGU) initiatives towards COVID-19 vaccine hesitancy mitigation. To obtain the level of vaccine hesitancy and the local government unit (LGU) initiatives assessment score of the two Philippine cities, the study uses Betsch, Schmid, Heinemeier, Korn, Holtmann, and Böhm's 5C (Confidence, Constraints, Complacency, Calculation, and Collective responsibility) Psychological Antecedents of Vaccination. On the basis of the findings, a multi-pronged and evidence-based intervention scheme on COVID-19 Vaccine Hesitancy Mitigation applicable to local governments, as informed by Bestch et. al Vaccine Hesitancy Potential Interventions is proposed.

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Sciforum-034393: Religious Coping and Hand Hygiene Behavior during COVID-19: The Impact of Fear and Perceived Knowledge

Aysha Batool[1], Rizwan Shabbir[2], Iqbal Hussain[3]

[1] Government College University, Faisalabad, Pakistan
[2] Faculty of Marketing, Lyallpur Business School, Government College University Faisalabad, Jhang Road Faisalabad, Postal Code 38000, Pakistan
[3] Ph.D. Student, Lyallpur Business School, Government College University Faisalabad, Jhang Road, Faisalabad, Postal Code 38000, Punjab, Pakistan

The coronavirus disease (COVID-19) has considerable impacts on people's lifestyle and behaviors. Researchers conclude that people use religion to cope with stressful life events. Similarly, the literature about pandemics shows that prevention behaviors are also adopted in order to avoid contagions. Considering the important issue of the impacts of COVID-19 on businesses and consumers, this working paper aims to examine the impact of COVID-19 fear and perceived knowledge on religiosity and adoption of hand hygiene behavior because religion is considered an important socio-cultural factor element in shaping consumer behavior. Data for this study is collected through an online survey using google document from Muslim consumers of Pakistan. The 421 questionnaire responses received within 15 days from 29 June till 13 July are analyzed through PLS-SEM with SmartPLS-3 software. The results demonstrate that people cope with the Coronavirus fear through inclining towards religious measures in order to achieve peace of mind. They also adopt hand hygiene behavior as prevention to the contagion. Moreover, the perceived knowledge about COVID-19 and the fear, both directly and indirectly through religiosity have positive impact on hand hygiene adoption behavior in Muslim consumers. This might be due to the fact that in Islam cleanliness is considered a compulsory etiquette of religious norms. Thus, the study extends the literature by providing significant empirical evidence about the role of religiosity in coping with fear of infectious diseases and in the adoption of preventive behavior. This work might be helpful for the policymakers and market managers by providing insights about the use of religious norms in media campaigns and public service messages for mitigating the adverse mental effects of COVID-19 as well as educating people about the importance of self-hygiene measures.

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Sciforum-034349: Removing Simazine from Water by Activated Charcoal Cloths

Farzad Rassaei

[1] Department of Soil Science, Isfahan (Khorasgan) branch, Islamic Azad University Isfahan, Iran

Charcoal has been used to sorb organic materials like simazine and atrazine in solution. Simazine is an herbicide and widely applied for controlling broadleaf weeds. It can retain and relocate in soil and then enter to water and finally change the quality of water. At higher rates, it is used for non-selective weed control in industrial areas. Before 1992, simazine was used to control submerged weeds and algae in big aquariums, swimming pools, farm ponds, fish hatcheries, ornamental ponds, and cooling towers. Simazine is available in water-dispersible granule, wettable powder, liquid, and granular formulations. The purpose of this study was to study whether activated charcoal cloths (knitted, KT, single-weaving, SW, and dual weaving, DW) to remove simazine from aqueous solutions compared to activated charcoal (as a control) which currently present in pollution control structures, are more efficient. The methods included flow through, desorption / degradation and sorption kinetics experiments by applying 50 and 1000 μg/L simazine solutions. Our results indicated that after 30 min of incubation time 22.8% to 35.1% of simazine in solution sorbed by the activated charcoal, while the activated charcoal cloths sorbed 77% to 97% of simazine in solution. Our results in flow through studies indicated that in the 0.75, 5 and 10 min of incubation time the SW sorbed 87.4%, 75.2%, and 51.2% of simazine, one by one. The sorbed simazine by the SW did not degrade and little quantity (2% of the sorbed simazine) were desorbed by methanol after 28-days incubation time. The activated charcoal cloths are more efficient to remove simazine from water.

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Sciforum-033623: Residential IEQ Improvement Using UVGI Lights and Carbon Fibre Filters: Mould and Relative Humidity Assessments

Mohammad Al-Rawi[1], Annette Lazonby[2]

[1] Waikato Institute of Technology
[2] The University of Auckland

Many New Zealand residential homes suffer from poor indoor environmental quality (IEQ). Cold, damp, and mould-ridden homes can cause serious respiratory health problems. Poor IEQ can arise due to poor insulation and ventilation, and is compounded when residents cannot afford heating. Features of the residential building code mean many New Zealand houses built under old standards lack wall insulation, have single glazing on windows and are poorly ventilated. A major indicator of poor IEQ is mould growth, which can cause, or exacerbate, respiratory illness. This project assesses the results of modifying an existing dehumidifier to include ultraviolet germicidal (UVGI) lights and two different types of filters (CityPleat and 30/30). The original device altered IEQ by removing moisture. The modified device was designed to further improve IEQ by performing filtration and purification of the air, with the addition of the CityPleat, 30/30 filters with the UVGI lights. This project investigates the impact on various IEQ elements, such as room temperature, particulate matters ($PM_{2.5}$), and relative humidity using an air imaging sensor (compatible with current WHO guidelines), with a focus on mould growth. We found the different filtration scenarios presented reduced the relative humidity effectively in the room compared to the baseline dehumidifier action only. The results show that adding the 30/30 filter with the UVGI lights increased the room temperature by 2.2°C, reduced the relative humidity by 10%, and reduced the $PM_{2.5}$ values from 2.5 μg/m³ to 0.4 μg/m³ in the room after three hours of operation. Mould growth, as measured in agar plate coverage, was also reduced by the addition of the filtration and UVGI lights.

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Sciforum-048269: Statistical Modeling for Air Quality Prediction in Bangladesh

Mariam Hussain[1], Sajia Afrin[2], Afroza Irin[3], Seon Ki Park[4]

[1] Climate and Energy Systems Engineering, Ewha Womans University, Seoul, Republic of Korea
[2] Dept. of Public Health, University of South Asia, Dhaka, Bangladesh
[3] Dept. of Development Studies, Bangladesh University of Professionals, Dhaka, Bangladesh
[4] Climate and Energy Systems Engineering, Ewha Womans Univesrity, Seoul, Republic of Korea Environmental Science and Engineering, Ewha Womans University, Seoul, Republic of Korea Center for Climate/Environment Change Prediction Reseach, Ewha Womans Unive

Bangladesh stands one of the 10th positions for the worst air quality in the word. Air quality does not only affect human health but also poses a threat to sustainable development. Despite other sources, wind plays a vital role dispersion and transports for air pollutants. Moreover, rainfall also causes depositions for pollutants. This research aims to find the relationship between air pollutants and meteorological variables for predicting air quality in Bangladesh. The study incorporates meteorological variables from National Aeronautics and Space Administration (NASA) under the prediction of worldwide energy resources (POWER) project and analyzed based on descriptive statistics. As a source for air pollutants, the experiments include Air Quality Index (AQI) from the Department of Environment (DOE), Bangladesh. These datasets are daily observations for seven years from 2014 to 2020 for two metropolitan cities: Dhaka and Chittagong. Based on linear regression (LR), the findings show strong positive relationship between meteorological variables and AQI such minimum temperature, minimum wind speed, and rainfall about 0.9072, 0.557, and 0.603, respectively. Weak positive relationships are about 0.394, 0.47, and 0.445 for maximum temperature, maximum wind speed, and relative humidity, respectively. For Dhaka AQI as a source for air pollutant, multi-linear regression (MLR) established a predictive model for AQI (AMLR) with meteorological variables: maximum temperature, minimum temperature, and wind speed, and found accuracy of 93.02% accuracy. The predicted AQI for Chittagong using MLR indicated 0.75 linear correlation with observations. The limitation for model prediction is missing information and data unavailability for validation. The research wishes to apply AMLR model to predict air quality for various districts that do not have observation sites. The research findings will help for mitigation and management for air quality in Bangladesh for reaching sustainable development and healthy environment.

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Sciforum-031098: Sustainable Development Goals and Malaria

Tomas Jezek

[1] independent

As a part of Millennium Development Goals, special attention was given to combating malaria. A successor agenda of the Sustainable Development Goals (SDGs) keeps the health centrally positioned. Indicators for the 3rd SDG "Good Health And Well-Being" include the incidence of malaria. Assuming the complexity and interdependence of health and development, we have looked at relationships between SDG and disease burden.
Methods
We made the dataset of available values for all countries globally. The parameter of malaria burden was defined by the malaria incidence rate as the number of malaria cases per 1000 of a population at risk per year. Values were transformed by common (standard) logarithm. Associations were examined by the Pearson product-moment correlation coefficient (r). To assess the magnitude of correlation, strong, moderate and weak correlations were based on r thresholds of 0.70 and 0.50. The association between Global Index Score and malaria burden was analysed by linear regression. Statistical significance was determined at p0.05.
Results
The malaria burden is significantly strongly associated with Global Index Score and SDGs 3, 7.
The malaria burden is significantly moderately associated with SDGs 1, 4, 11.
The malaria burden is significantly weakly associated with SDGs 2, 5, 6, 8, 9, 12, 15, 16.
The malaria burden is significantly negatively related to Global Index Score -0.025 (log), OR 95% log (-0.029 - -0.020). Malaria burden and Global Index Score have significant interactions to each other.
Conclusion
Out of 17 SDGs, 13 are significantly associated with malaria burden. Global Index Score and malaria burden are mutually interacting, which indicates complex relationships and possible bidirectional causality of both. It is imperative to combat malaria burden, which in turn will help countries to reach SDGs.

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Sciforum-034236: The Impact of Online Activities on Students: Screen time vs. Green Time

Carolina Ana-Maria Bodea-Haţegan[1], Dorina Anca Talaş[2], Raluca Nicoleta Trifu[3]

[1] PhD Associate Professor, Department of Special Education, Faculty of Psychology and Education Sciences, Babeş-Bolyai University, Cluj-Napoca, Romania
[2] PhD Associated Lecturer, Department of Special Education, Faculty of Psychology and Education Sciences, Babeş-Bolyai University, Cluj-Napoca, Romania
[3] University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj-Napoca. Departament of Medical Education. Discipline of Medical Psychology.

The aim of this study is to highlight the importance of time management during online activities for students. At the beginning of the pandemic period, inMarch 2020, after the first online activity, a pilot study was conducted to identify the students' perception of online activities, the time they should spend online during the day, the time students spend on different devices (computer, tablet or mobile phone), and the difficulties they have during their first online activities. A total of 106 students (44 boys and 62 girls) in 5th grade, from a middle school located in an urban area in Romania participated in this study. The results demonstrate that the greatest number of students (33), representing 31.1% of the sample, spend 1-2 hours/day online, but there are 6 students (5.6%) who spend more than 6 hours/day online. Most of the students (56.6%) consider that they should have three online activities/day and the duration of these activities should be 40-50 minutes. Strategies to promote students' wellbeing during online activities are also presented, focusing on identifying the best way to use the time spent online in order to reach the necessary curricular objectives and to avoid health problems. The conclusions highlight the importance of finding the best time management strategies for online activities to avoid future health problems for students, especially in the situation in which, at the global level, the pandemic period has not even ended. As screen time is a controversial factor, with major implications for health and education, data are important for the sustainability of the educational system and future decisions.

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Sciforum-033989: The impact of the architecture and urban planning towards the health of the habitants: Case study Ohrid UNESCO city in North Macedonia

Suzana Kasovska Georgieva

[1] Institute for Research in Environment, Civil Engineering and Energy

The purpose of this paper is to examine the correlation between the architecture and urban planning and the health of the habitants of the UNESCO city Ohrid in North Macedonia. Research instruments in a form of questionnaires were used to assess the impact of the architecture towards the health of the habitants. A management plan for the cultural heritage for the Ohrid UNESCO city was created as well. The findings from the research present that urban planning is very effective tool in creating a more sustainable city, and that the habitants are aware of the impact of the architecture on their health. Additionally, the implementation of the measures for urban planning in the management plan would increase the positive effects on the health of the habitants of the city. The study will increase the understanding of the architecture and urban planning, as new sustainable development policy in protecting the health of the habitants in one city.
The research contributes to the field of sustainability, by considering relatively new and unexplored study in North Macedonia and worldwide. This study is assessing the level of the impact of the architecture towards the health of the habitants in the city, as well as the awareness of the habitants for this impact.

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Selected Talks

Sciforum-031079: Green hospitals - Environmental hotspots and best practice in the health sector

Regula Keller, Matthias Stucki, Karen Muir

[1] Zurich University of Applied Sciences

Hospitals consume resources on a large-scale and have significant environmental impacts. However, science-based information on the environmental footprint of the hospital sector and the potential for improvement in sustainability is not available, as detailed bottom-up analyses of the environmental impact of hospitals are rare. The research project “Green Hospital” sets out to close this gap. As part of the National Research Programme "Sustainable Economy: resource-friendly, future-oriented, innovative" (NRP 73) of the Swiss National Science Foundation (SNSF), it aims to analyse and reduce the environmental impact of hospitals. The impact is assessed using a life cycle approach and applying the ecological scarcity method that considers various environmental impacts.
A preliminary analysis was carried out using data from two Swiss partner hospitals. It showed that buildings, catering, and energy demand are the areas with the highest environmental impact. Further relevant impacts arise from medical products, waste and wastewater, textiles and laundering, and pharmaceuticals. The supply of electronic devices and household products, patient transport by ambulance, and the use of water and paper contribute fewer impacts.
Based on this analysis, key data were identified and subsequently collected from 33 Swiss hospitals by means of an online questionnaire. The analysis showed that the energy demand varies considerably: normalized by full time equivalent (fte), it varies between 4 and 20 megawatt hours per year. In terms of environmental impact, variation is even higher, ranging between 0.3 and 4.6 million eco-points per year and fte. Similar to energy consumption, we will present the environmental impact of the above mentioned areas for the 33 hospitals.
Based on insights of these analyses and in collaboration with hospitals, interest groups, and companies, best practice approaches will be identified that reduce the environmental impact of hospitals and offer logistical benefits.

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Sciforum-032016: Healthy Cities today and other "Theme cities" networks: a survival guide

Julien Forbat[1], Jean Simos[2], Evelyne de Leeuw[3]

[1] University of Geneva, Geneva School of Economics and Management
[2] University of Geneva, Institute of Global Health
[3] University of New South Wales, Centre for Health Equity Training, Research & Evaluation (CHETRE)

Starting with the concept of "healthy cities" in the 1980s, the trend towards promoting better living conditions in urban settings has rapidly grown to encompass today countless "theme cities" networks. Each network tends to focus on more or less specific issues related to well-being and quality of life in cities. Considering this growing body of "theme cities" networks, we intend to clarify the extent to which they really differ from each other. In order to do so, we analyzed twelve "theme cities" programs launched between 1986 and 2013. Taking into account evidence-based studies, as well as "theme cities" own literature, we carefully considered their premises, objectives, processes and outcomes. The framework built to conduct this comparative analysis incorporates several criteria: type of governance, role of technology, membership mode, policy development and implementation, equity issues, transparency, health, and environmental accountability. Assessing whether these "theme cities" networks overlap, or if each of them offers original insight into essential aspects of urban quality of life, we show that their characteristics are extremely diverse, notably reflecting in the way they embrace politics, equity issues, or the role of technology to promote better health and quality of life in urban settings. We conclude by developing a typology of "theme cities" networks putting forward four groups largely based on their vision of technology and their type of governance. This typology is aimed at increasing transparency and could notably be used by cities willing to join and support networks with a similar vision of well-being in urban settings.

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Sciforum-033632: Impact of Microplastics on Marine and Freshwater

Ashok Vaseashta[1, 2, 3], Viktor STABNIKOV[4], Andriy MARININ[4]

[1] International Clean Water Institute, Manassas, VA USA
[2] Riga Technical University, Kalku Street, Riga, LATVIA
[3] Ghitu Institute of Electronic Engineering and Nanotechnologies, Academiei str., 3/3, Chisinau, MOLDOVA
[4] National University of Food Technologies, 68 Volodymyrska Str., Kyiv 01601, UKRAINE

Growing scientific and public awareness of microplastic debris in the marine and freshwater environment is fueling concerns of its impact on aquatic ecosystems and even public health. A major source of water-polluting microplastics are polyethylene and polypropylene with lower than water density and hence aggregate near the water-air interphase with neustonic hydrophobic cells and spores of bacteria causing environmental, health, and food safety challenges. We evaluated the concentration of microplastics with the sizes less 100 μm floating near water-air interphase, to track the fate of this microplastics, to analyze microbial coating of this water pollutant, and assess potential environmental impacts of biofilm-coated neustonic microplastics. These particles were subsequently concentrated using microfiltration of water samples. The particles in a thin layer of water-air interphase then investigated using scanning electron microscopy, fluorescent scanning microscopy, flow cytometry, and particle analyzers. Floating microplastics, hydrophobic water pollutants, and hydrophobic cells of bacteria typically concentrate within a few micrometers layer of water-air interphase. Hydrophobic, and often putative pathogenic bacteria, dominate in water-air interphase, being attached to water surface or to the hydrophobic microplastics. Biofilm-coated microplastics are more attractive for consumption by aquatic species than pure microplastics, which significantly increases negative impacts of microplastics on aquatic ecosystems and public health. Even small quantities of biofilm-coated microplastics could pose a significant negative impact on aquatic environment sustainability and ecology, considering their accumulation in the micro-layer of water-air interphase. We will discuss such negative impacts of microplastics and path forward for future sustainability.

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Sciforum-030869: Responses to Urban Health Challenges in the Context of Rapid Urbanization

Roderick John Lawrence

[1] Honorary Professor, Geneva School of Social Sciences (G3S), University of Geneva, Switzerland

Cities and urban development are complex, dynamic, and systemic societal phenomena that have many positive and negative consequences for health and well-being. There is growing recognition that narrow sector-based approaches that do not address the health impacts of the built environment are unlikely to achieve potential improvements for urban populations. In particular, those conventional sector based contributions that assess the environmental, economic, and social impacts of urban projects and policies should be enlarged to consider impacts on health and well-being. Planetary health serves as an overarching framework which effectively encompasses core principles for promoting and sustaining health because it places environmental, economic, cultural, and social activity in the context of global socio-ecological systems, postulating that both individual and community health depend on maintaining the proper functioning of all those systems. This integrated framework offers many potentials for the implementation of the United Nations 2030 Agenda for Sustainable Development with its 17 Sustainable Development Goals (SDGs) and 169 targets. This paper acknowledges that the inclusion of SDG3, which aims to 'ensure healthy lives and promote well-being for all ages', is admirable. However, it is unfortunate that the principles of ecological public health and planetary health remain merely implicit. In addition, it argues that the tacit relationship between this and other goals, especially SDG11, which aims to 'make cities and human settlements inclusive, safe, resilient and sustainable', could have been prioritized to further promote relational thinking and systems analysis in research and practice that are the foundations of change processes towards sustainability. Finally, the implementation of the SDG framework, in tandem with the New Urban Agenda, will require novel types of convergence and collaboration between researchers, professionals, politicians, and citizens in transdisciplinary inquiry, and when coproducing urban projects that transcend disciplinary and sectoral boundaries.

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Sciforum-032073: The Spatial and Social Components of Community-led Green Spaces and its Contribution to the Health and Wellbeing of Medellin Low-income Communities

Diana M. Benjumea Mejia

[1] Singapore University of Social Sciences
[2] NeuroLandscape

In the last decade, there has been a surge in projects initiated by urban low-income residents in Medellin to revitalise urban green spaces through pro-environmental initiatives. Urban green spaces in these neighbourhoods are believed to be the repositories of diverse socially constructed and perceived meanings defined by the prosocial and self-reflective approaches of the communities to achieve alternative methods of governance over the territory. This study was designed to investigate the underlying spatial and social components that emerge after the community-led green spaces are built. Two neighbourhoods in Medellin were investigated: Villatina (commune 8) and Eduardo Santos (commune 13). A quasi-longitudinal mix-methods study was conducted from 2016 until June 2021. Ethnographic field work, interviews, focus groups and surveys were collected with residents of the two neighbourhoods. The results of this study suggest that there are underlying social and spatial components that emerge after the community-led green spaces are built and these are crucial to forge prosocial behaviours, activism, stewardship, and protection from crime. Additionally, the active engagement of the communities in self-governed placemaking process creates an immediate sense of place defined by social factors such as ownership, learning, community coexistence, cooperation, sustainability, and ecology. These components contribute to the mental and physical health and wellbeing of low-income residents and creates unique social and environmental values.

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Sciforum-048287: Using the Theoretical Domains Framework to Identify Sociocultural Barriers and Facilitators to Access and Use of Primary and Maternal Healthcare Services by Rural Bangladeshi Women

Sanjoy Kumar Chanda

[1] PhD student, School of Healthcare, University of Leeds, UK

The United Nations (UN) Sustainable Development Goals (SDGs) call for ensuring healthy living and well-being for all by 2030. Increased service use in Bangladesh in recent decades has contributed to healthcare outcomes, yet there is little understanding of sociocultural barriers to women's healthcare access and use at primary health centres in rural Bangladesh.
The aim of this study is to apply the Theoretical Domains Framework (TDF) to identify sociocultural barriers and facilitators to primary and maternal healthcare access and use of Bangladeshi rural women. Three focus groups and 31 interviews were undertaken with women, their husbands and healthcare providers to collect data. The questionnaire was informed by the TDF, which is based on theories of behaviour change. All focus groups and interviews were taped and transcribed. Data were analysed thematically using a framework approach aided by NVivo12 software.
The sociocultural aspects relate to several barriers to women accessing healthcare services from rural health centres, such as lack of family reinforcement, religious obligations to the uptake of birth control techniques, social stigma, gender of the healthcare providers, traditional family norms preventing husbands to support wives, and cost of care. On the contrary, sociocultural facilitators include the support of families, neighbourhood and media to access healthcare by women. The findings aligned with five TDF domains: knowledge, social/professional role, reinforcement, environmental context and resources, and emotion.
This study identified several key behavioural constructs aligned with the TDF that can be targeted when developing increasing healthcare access and use interventions.

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Abstracts

Session W. Water

Posters' abstracts

Sciforum-048449: Possibility of removing pollutants and microplastics from wastewater with using PAX coagulant

Piotr Jachimowicz, Agnieszka Cydzik-Kwiatkowska

[1] Department of Environmental Biotechnology, University of Warmia and Mazury in Olsztyn

Microplastics are being recognized as emerging pollutants entering wastewater treatment plants. In this study, aluminum-based salt (PAX) was used in the presence of polyethylene (PE) in wastewater to check the possibility to remove pollutants and microplastics from the liquid phase. The coagulation process was using PAX at concentrations between 2 and 8 mg/L PAX in a beaker experiment with wastewater. The research results showed that with the increase of the coagulant dose, the efficiency of COD (30% vs 52%), N-NH_4 (2% vs 11%), and P-PO_4 (32% vs 46%) removal increased. The dose of the coagulant affected the pH decrease in wastewater. Plastic particles with a size of 710–800 μm remained in the liquid phase to a greater extent (from 80% to 100%) with increasing concentration of the coagulant. Further experimentation with other coagulants and solution conditions is needed to enhance understanding of the effectiveness of wastewater treatment processes for microplastic removal.

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Sciforum-041670: Self-Sustaining Resource Circulated Sanitation: A Nature-Based Sanitation Solution toward Leaving No One Behind

Shervin Hashemi

[1] Institute for Environmental Research, Yonsei University College of Medicine

Water and sanitation are critical global challenges. The sixth item for sustainable development goals (SDG6) was defined to provide sustainable access to adequate sanitation for all, leaving no one behind. In the year 2018, the United Nations has proposed investigating nature-based solutions (NBS) for water problems, and the World Health Organization (WHO) published guidelines on sanitation and health. Accordingly, an innovative sanitation system named as "Self-Sustaining Resource Circulated Sanitation (SSRCS)" has been developed along with a showcase project objecting to investigate the technical efficiency and sustainability of it for implementation in a remote area. Consequently, one set was installed at a farming center located in a suburban area of Seoul to offer public hygiene services. The system includes four main parts: dry toilet seat, urine reactor, feces reactor, and rainwater harvesting system to provide water for sanitary applications. The seat efficiently separates urine from feces, storing them in their reactors.

Urine is stored in a tank-in-series reactor, while feces, along with other hygienic materials, such as biodegradable toilet papers, are led into a batch reactor, including sawdust for the composting process. The reactors are well-designed based on the estimated amount of usage and retention time of 10 to 15 days. The nature-based treatment process includes adding a microflora, containing nitrifying microorganisms, to urine and feces reactor. The nitrification process gives benefits for reducing the stabilization time for urine and enhancing the biodegradation of feces. Thereafter, treated urine is collected from the last tank, and composted feces is collected from its reactor and mixed with agronomic soil to prepare soil samples for plant cultivation.

Similarly, another cultivating soil sample was made by mixing the agronomic soil with commercial fertilizer. These soil samples were used to cultivate white radish plants under the same planting to harvest procedure. This treatment showed efficiency in increasing the fertilizing potential of urine by modifying its nitrogen profile.

Moreover, pH reduction as a result of nitrification led to reducing ammonia losses as gas along with odor production. This treatment method also enhanced the feces composting process by providing a more favorable condition for feces biodegradation.

Moreover, this method was useful in the efficient removal of fecal indicators. Results of white radish cultivation show that there was no statistically significant difference for nutrient release in soil samples treated with the products of SSRCS and commercial fertilizer. Thus, the water and sugar content, along with the accumulated nutrients in leaves and roots of white radish plants cultivated in soil treated with the SSRCS produces, was more than the other ones. The sustainability of the SSRCS system was proved in this project by its efficiency in reducing water and energy consumption along with recycling urine and feces to be utilized as fertilizer and soil conditioner. The benefits acquired by fertilizer production, water-saving, and higher agricultural productivity are substantial. This system meets the recommendations of WHO guidelines, does not need complicated infrastructure, and provides NBS for sanitation problems, make it suitable for remote areas. It can also be considered as a step ahead toward SDGs 1, 2, and 6.

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Sciforum-047908: Management of sludge from wastewater generated in swimming pool facilities as part of intensified waste stream recycling

Edyta Łaskawiec

[1] Environmental Biotechnology Department, Silesian University of Technology

The decrease in available freshwater resources is one of the consequences of climate change. It is necessary to make a clear distinction between two circuits of our water use: the first circuit for drinking and most important hygiene purposes, which represents the highest-quality water, while the second circuit should focus on maximizing the use of rainwater and recycled or reclaimed water.
Swimming pools are water-intensive facilities that also generate large volumes of wastewater: from 34 to 1,000 m^3/day depending on the size of the pool area and the number of water treatment circuits. A large share of this volume is made up of wastewater from the rinsing of filter beds; washings. They have a low content of organic compounds, and their treatment is related primarily to the need to reduce turbidity and the removal of chlorine residues from the disinfection process, so they may be reused with a small expense on the processes of dechlorination and sedimentation of suspended solids.
In the case of a small swimming pool facility fitted with two independent water filtration circuits with beds of 2.54 m^2 each (on a 48-hour operation cycle), the volume of generated washings exceeds 180 m^3 per month. Preliminary analyses indicate that the proportion of sludge in 1 liter of washings is between 2% and 8% by volume.
This research study investigated the possibility of using wash sludge as a medium to improve soil conditions for plants. The subject of the study was sludge from washings collected in a circuit fed by a diatomaceous earth precoat filter. Sedimentation capacity of washings during gravitational compaction, particle diameter distribution of sludges and ecotoxicological properties in tests with plant organisms (linear measurements: growth inhibition, germination inhibition, damage to organelle structures) were analyzed.

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Sciforum-042376: Removal of Arsenic from water through FeO coated hollow poly (methylmethacrylate) microsphere for mobility in water purification system

Dhiraj Dutta[1, 2], Jyoti P Borah[1], Amrit Puzari[3]

[1] NIT Nagaland
[2] DRL Tezpur India
[3] National Institute of Technology Nagaland

The bibliography of peer reviewed literature on arsenic contaminated drinking water in the world indicates high level of arsenic contamination in large areas which include significant portion of Bangladesh, China, West Bengal (India), and smaller areas of Argentina, Australia, Chile, Mexico, Taiwan (China), the USA, and Viet Nam. Arsenic, from both natural and anthropogenic sources, is mainly transported in the environment by water. The concentrations of arsenic in open ocean seawater and groundwater is 1–2 μg/L, although groundwater concentrations can be up to 3 mg/L in areas with volcanic rock and sulfide mineral deposits [1]. Long-term exposure to arsenic from drinking-water and food can cause melanosis, edema, keratosis, dark spots on the chest, enlargement of liver, kidney, and spleen; cancers of skin, lungs, and urinary bladder [4 - 6]. Thus, considering above human health effects, WHO has recommended that arsenic should be less than 0.05 mg/l in drinking water. The BIS has recommended that the arsenic in drinking water should be less than 0.01- 0.05 mg/l. Hence, arsenic removal from drinking water sources has become a major concern nowadays for individuals at household level and water distribution or supply companies [7,8,9,10].

Works described here consist of the synthesis, characterization, and adsorption efficiency evaluation of iron oxide coated functional hollow poly (methyl methacrylate) microspheres (FHPM). For synthesis of hollow poly (methyl methacrylate) microspheres (HPM) solvent evaporation [11] techniques was used. Characterization was performed by using optical microscopy (OM), scanning electron microscopy (SEM), Fourier transform infra-red spectroscopy (FTIR), energy dispersive X-ray diffraction (EDAX), and thermogravimetric analysis (TGA) transmission electron microscope (TEM), vibrating-sample magnetometer (VSM) which proved the formation of FeO coated HPM.

The bulk density of the material was measured as 0.60gm/cc for uncoated HPM and 1.27gm/cc for FHPM due to inherent hollow feature leading to drastically enhanced surface area. The adsorption efficiency of FHPM to remove As from contaminated water was determined by conducting adsorption isotherm studies. Effects of various parameters like contact time, solution pH, initial concentration of metal ion and adsorbent dosage were investigated in a batch adsorption system. Due to mentioned specific features the synthesized material showed enormously high adsorption capacity as revealed from the results of adsorption isotherm studies in comparison to conventional iron oxide coated sand used for removal of As from water. Kinetic studies showed that the adsorption equilibrium time was reached within 80 minutes and the adsorbent showed a high affinity for As ions at pH value of 7.5

Thus, the study showed that iron oxide coated hollow polymethylmethacrylate microsphere exhibit higher efficiency to remove As (III) ions from the contaminated water. The FHPM posses many advantages such as low density, high surface area and are economically viable. The arsenic removal efficiency is influenced by many operational parameters, such as pH, contact time, and concentration of arsenic ions in the solution. The adsorption efficiency of FHPM is analyzed by using Langmuir and Freundlich adsorption isotherm models. After analyzing the isotherm results, it is revealed that the iron

coated HPM microspheres can be used to remove arsenic contaminants from the water sources with high efficiency and low operational cost.

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Selected talks

Sciforum-048305: Alternanthera phyloxeroides: Do we need to be concerned about this freshwater weed in approaching decades?

Ria Ghosh, Puja Ray

[1] Presidency University, Kolkata, West Bengal, India.

***Alternanthera phyloxeroides*: Do we need to be concerned about this freshwater weed in approaching decades?**

*Ria Ghosh[1] and Puja Ray[2]
Multitrophic Interactions and Biocontrol Research Laboratory, Department of Life Sciences, Presidency University, 86/1 College Street, Kolkata-700073, India.
Email: riaabhi@yahoo.com

ABSTRACT

Alien invasive species cause an immeasurable amount of noxious culminations due to its greater force on population dynamics by interfering with the native ecological phenomenon. With the continuous reshuffling of its habitat ingredients, these weeds are also embellishing themselves with greater stress-tolerant attributes and dissemination for competing with other existing biodiversity of that particular biome to invade and is framing the ecosystem to be susceptible of these invasions. *Alternanthera phyloxeroides,* an amphibious herbage, is becoming a complicated menace for freshwater ecosystems. Climatic sustainability and man-mediated dispersal are responsible for its cosmopolitan distribution. It is a momentous task to apprehend when, where, how, and why the alligator weed is persisting as it renders both positive and extensive negative impacts on us, hampering the ecosystem's services, biodiversity's survival, and the economics as well. These extreme characteristics of the alligator weed result in the disruption of the global food web, habitat destruction, reduction in species richness, water quality, blockage in transportation routes, drainage systems, food and fodder scarcity, degradation of aesthetic values, and many others. Here, we are trying to reveal if there are any chances of having terrible influences from *A. phyloxeroides* in terms of ecology and economy in the coming years. Extensive work on manual, chemical, and biological control has been done in an effort to limit this weed with limited success. Therefore, further investigations are needed to speculate the forthcoming positions. We should endeavour extra time and expenses in the control operations before times to avoid any kind of future disaster.

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Sciforum-048478: Computer-Vision-Based Remote Monitoring of Ocean Salinity for a Sustainable Future

Thomas Y Chen

[1] The Academy for Mathematics, Science, and Engineering

Understanding varying levels of ocean salinity and monitoring changes in marine systems are key factors in studying ocean circulation and interactions at the air–sea interface. Previously, both in situ and remote sensing methodologies have been harnessed to facilitate the observation of ocean salinity. In this work, we propose a computer-vision-based remote sensing framework by which we train deep neural networks on high-resolution imagery to classify samples of the Atlantic Ocean based on levels of salinity. While the work is preliminary, we note that saline water samples with different proportions of salt have sufficiently different textures for the model (convolutional neural network) to detect. The output of the model is a set of categories from 0 to 5 representing the level of salinity of the sample of water captured in the image as correlated with the ground truth labels. This research sets a baseline for future large-scale automated projects that can yield significant insights regarding human activity, climate change, and marine biogeochemistry. Future work shall involve utilizing multitemporal imagery to facilitate change detection, which is useful for understanding changes in salinity over time.

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Sciforum-048316: Global rice consumption and water scarcity: Refining the assessment by using crop-specific and country-specific factors

Fabio Sporchia[1], Dario Caro[2], Alessandro Petraglia[1], Federico Maria Pulselli[3]

[1] Department of Chemistry, Life Sciences and Environmental Sustainability, University of Parma, Italy
[2] Department of Environmental Science, Aarhus University, Roskilde, Denmark
[3] Ecodynamics Group, Department of Physical Sciences, Earth and Environment, University of Siena, Italy

Rice is the staple food for half of the global population. However, compared to other major crops, such as maize and wheat, rice has a higher water footprint and, due to its particular cultivation techniques, it is a major source of GHG emission, as well as exploitation of large amounts of cropland. Despite a large part of global paddy fields is rainfed, exploiting green water, a significant extent relies on irrigation, i.e., blue water use. Agricultural blue water use can lead to over-abstraction in certain water basins, especially when other sectors compete for the same resource. Climate change is likely to exacerbate this possibility by increasing the drought severity or frequency, as well as floods in certain areas of the globe. Water scarcity linked to global rice production and consumption has been previously estimated by using non-specific country-average weighting factors. Here, we present a comparison between the use of non-specific and crop-specific water scarcity characterization factors for the assessment of the water scarcity linked with global production and consumption of rice in 2016. Based on the available water remaining (AWARE) method, we reveal that crop- and country-specific factors can significantly increase the accuracy of water scarcity assessments. The use of the most recent crop-specific factors reflected in an almost ten times higher global water scarcity value and in the variation of the main rice consumption-related water scarcity drivers in terms of geographic areas.

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Sciforum-047690: Preparation and characterization of photocatalytic Dysprosium-doped TiO2 nanoparticles for water treatment: Solar photodegradation of methylene blue dye

Chaima Ouled amor[1], Kais Elghniji[2], Elimame Elaloui[2]

[1] Laboratory of Materials Application to Water, Environment and Energy (LAM3E), Faculty of Sciences of Gafsa, University of Gafsa, Tunisia.
[2] Faculty of sciences of Gafsa, University of Gafsa

In recent years, the photocatalytic process by using TiO_2 nanoparticles (NPs) has produced a great interest in wastewater treatment due to its interesting features, such as low-cost, environmental compatibility, and, especially, capacity to eliminate persistent organic compounds as well as microorganisms in water. In the present work, the photocatalytic activity of Dy-doped TiO_2 nanopowders synthesized by modified sol-gel method was studied under visible irradiation for water treatment applications. The Dy-doped TiO_2 nanoparticles were investigated for their photocatalytic degradation of methylene blue (MB) dye . MB dye was used as a pollutant model to estimate reactive oxygen species (ROS) generation and to correlate killing action of nanoparticles with the generation of ROS. Scanning electron microscopy (SEM), X-ray diffraction (XRD), Raman , and UV-Vis spectroscopy were used to characterize the as-synthesized nanomaterials. Photocatalytic showed that doping with an appropriate amount of Dy could reduce the radiative recombination process of photogenerated electron-hole pairs in TiO_2 and induces a significant enhancement in photocatalytic activity. Photocatalytic degradation efficiency exhibited by dysprosium -doped nanoparticles was the following: 5 mol% Dy-doped TiO_2 > pure titania.

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Sciforum-048347: Providing clean pathogen-free water to remote villages lacking electricity is feasible, inexpensive, and sustainable.

Friedrich K. Port[1], Mathieu Lamolle[2], Jochen Raimann[3], nathan w. Levin[4], Linda Donald[5]

[1] University of Michigan
[2] Water for Everyone (NGO)
[3] Renal Research Institute, New York, NY
[4] Easy Water for Everyone (NGO)
[5] Easy Water for Everyone

Providing pure water to communities is a major goal of WHO and the UN. We report here the experience since 2015 of our NGO *Easy Water for Everyone* in providing clean water by filter-sterilizing polluted water to remote villages in Ghana lacking electricity.
Methods: Polluted water is pumped up to a 1000 +L elevated tank and runs on demand through 8 reprocessed hollow fiber polysulfone hemodialyzers to a faucet. The hemodialyzer pore size of 0.003 micrometers rejects all viruses. The tank is filled 1–4 times weekly depending on demand. Accumulation of organic matter is back-washed 3 times daily. In the villages diarrhea and consequences are very common. Our local team meets interested village leaders for planning and long-term sustainability.
Results: Polluted water consistently contains E.coli, while filtered water (CSIR TESTING) is free of pathogens. Mothers and local health clinics report virtual absence of diarrhea after using purified water. This dramatic reduction was confirmed in our prospective research of the monthly diarrhea incidence before and after use of the system (doi.org/10.1038/s41598-020-68408-1). Some villages have become self-sufficient in filling the tanks and flushing the dialyzers three times/daily providing a flow of 250L/hour. Estimated daily cost for unlimited clean water averaged over 5 years is 2 US$ per village. A total of 25 villages in Ghana and one island In Uganda use this system with plans for doubling this number by early 2022 to reach 30,000 persons
Conclusion: We demonstrate that this system [1] effectively provides drinking water free of pathogenic bacteria and viruses, [2] leads to substantial health benefits, [3] is remarkably inexpensive, [4] can be maintained independently. It is ready for far broader application in hundreds of remote communities in Africa and beyond.

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Sciforum-047872: Treatment of Tropical Brackish Peat Water with Continuous Electrocoagulation

Nazeri Abdul Rahman, Calvin Jose Jol, Allene Allene Albania Linus, Verawaty Ismail

[1] Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak

Sarawak Alternative Rural Water Supply (SAWAS), implemented in 2018, aims to provide safe water to remote rural communities, which have been deprived of a water supply all this while. Despite the overall water supply coverage in the state is 84.1%, some rural coastal areas still experience low water supply. Thus, forcing the community to utilize the rainwater collection method for survival. In contrast, rural coastal areas in Sarawak have an abundance of unused tropical brackish peat water. As such, this study aims to determine the suitability of continuous electrocoagulation with tropical brackish peat water as a potential water treatment in Sarawak. Correspondingly, this study analyzes the salinity level of treated tropical brackish peat water according to the standard limit sets by the Department of Environmental in Malaysia. This study found that continuous electrocoagulation has high potential in treating tropical brackish peat water since high salinity removal is achieved within a short period. From this case study, estimated energy consumption for tropical brackish peat water treatment with continuous electrocoagulation is established at RM 0.12 for each meter cubic. In the kinetic modeling study of continuous electrocoagulation with tropical brackish peat water, it was found that the reaction fits with the Langmuir isotherm model and non-linear pseudo-first order with a maximum adsorption rate at 3,333.33 mg/g and K_1 at 0.71 min^{-1}, respectively. Overall, it is concluded that the application of continuous electrocoagulation as an alternative water treatment in Sarawak could partially support SAWAS intensive water supply need.

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Abstracts

Session ED. Education

Posters' abstracts

Sciforum-048457: A Multi-Centric Baseline Assessment for a Community-Based Intervention involving Gender-Transformative Approaches to Promote Retention of Girls in Schools

Shantanu Sharma[1], Aditya Bhardwaj[2], Faiyaz Akhtar[2], Rajesh Kumar Singh[2], Sunil Mehra[2]

[1] Lund University, Sweden and MAMTA Health Institute for Mother and Child
[2] MAMTA Health Institute for Mother and Child

While more than 95 percent of India's children attend primary school, less than half of 16-year-olds, just 44 percent, complete secondary education. Girls contribute the maximum proportion of dropouts from secondary education due to lack of sanitary facilities in schools and support from families, gender norms, bullying, and poverty. We developed a community-based intervention that aimed to promote retention of girls in schools using gender-transformative approaches, including gender-responsive constructive pedagogy training for teachers; gender-sensitive education for boys, parents, and communities; and empowerment of girls. A baseline assessment of 155 schools, 1204 girls, 571 teachers, 1122 boys, and 500 parents was performed using a cross-sectional survey across 11 districts from 5 states in India. Multi-stage sampling was adopted, and data were collected using pre-structured and validated quantitative questionnaires. We found that the dropout rate was 14% among girls, that 6% of schools did not have a separate toilet for girls and 57% did not have incinerators, that 36% of teachers were not trained on menstrual hygiene management, and that 28% did not teach girls about menstruation. Furthermore, 47.8% of boys agreed that boys' education is more important than girls, and 28%-30% of parents agreed that girls should be married early, and their education is not important. Half of the schools did not have adolescent clubs or platforms to discuss menstrual hygiene issues, and 14% did not have parent–teacher meetings. Nearly one-fourth of the girls could not go to school during periods, and 53.5% were unaware of menstruation before the start of school. The findings highlight gaps, such as lack of facilities in schools and teachers' preparedness towards girls' menstrual education, negative attitude of boys and parents towards girls' education, and a high dropout rate. Girls' education and empowerment is a cornerstone towards the sustainable development of societies and nations.

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Sciforum-047438: Greening universities in the light of Grounded Theory with Axial Coding: A Methodological Approach in an Exploratory and Descriptive Research

Shantha Indrajith Hikkaduwa Liyanage

[1] Botho University, Gaborone Campus

Greening universities in the light of Grounded Theory with Axial Coding: A Methodological Approach in an Exploratory and Descriptive Research

Shantha Indrajith H. Liyanage*
Faculty of Business & Accounting, Botho University, Botswana.
***shantha.indrajith@bothouniversity.ac.bw**

Prof. Fulu Godfrey Netswera,
Faculty of Management Studies, Durban University of Technology, South Africa

Prof. Jan Meyer
Business School, North-West University, South Africa

Prof. Christoff Botha
Business School, North West University-Mafikeng, South Africa

Greening university is a new social phenomenon, but without sufficient theory previously developed. The abundant interdisciplinary, multidisciplinary, and transdisciplinary research articles have developed theories related to various aspects of green university in isolation. Consequently, this exploratory study began with very few ideas of greening university focusing on grounded theory.
The bottom-up coding began breaking data from a theoretical sampling of 97 previously published research articles. The vivo/literal codes from them were labelled as open coding. After that, open codes were linked as axial coding founded on coding family (dimension), dimensions, elements, and properties. Coding family enables theory to emerge from data fostering theoretical sensitivity. Finally, selective coding integrated categories forming into theories, such as green corporate governance, green corporate culture, and seven more dimensions.
After the exploratory research, the descriptive research founded on empirical interview data from five types of stakeholders of universities, Professors, Senior Lecturers, Academic Managers, Non-Academic Managers, and Students. The thematic analysis process results in designing a blueprint for greening universities. The study is significant for novice Glaserian and Straussian researchers in practice.

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Sciforum-047801: On the road to 2030 in achieving Sustainable Development Goals (SDGs): Equality access to higher education amidst COVID-19.

Dulani Daminda Kuruppu

[1] General Sir John Kotelawala Defence University, Sri Lanka

SDGs address global challenges with a focus to 17 SDGs originally introduced by United Nations. The fourth goal of it related to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all". However, it is a timely requirement to reflect whether, do our students are getting the opportunity to access for education in equal manner during COVID-19 pandemic. The objective of this research was to evaluate, how does the university students get the opportunity to equally access for this online lessons during COVID-19 pandemic. The study group consisted with 31 engineering undergraduates who followed one of my module. There were 4 foreign students from the African region. They went to their countries for last semester vacation and they could not return back to the university as the airport was closed due to the pandemic. Therefore, they were asked to join for online lectures as same as our local students. It was observed that there were only 22 (71.0 %) students who frequently took part in my online lecture while there were 2 (6.5 %) students who took part in the online lecture time to time. Further, it was also noticed that there were 07 (22.5 %) students who never took part for the online lecture. In order to find out the reasons for not logging for the lectures, I called the students personally and interviewed them to find out the reasons for their zero attendance. I conducted these interviews at the 4th week of the semester with the students where the semester expands for total of 15 weeks. It was identified that there was one student who could not access to the online lectures due to internet issues as he lives in a rural area. Further, the rest of the students were informed that they experienced a lot of interactions with the internet facilities provided which made unable them to frequently logged to the online sessions. Therefore, I had to email my lecture note instead of the power point presentation for the students who are unable to log to the online lectures due to interruptions of the internet. In conclusion, it was clear that even at the higher education level, they are students who cannot access to online sessions due to issues of the internet facilities. It is a main issue in the develop countries. It was suggested that it is required to accelerate the progress of removing barriers which tend keep the students from online lectures. Furthermore, it is essential to take actions to reduce inequalities in education on our way to achieve SDGs in 2030.

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Sciforum-048358: The adoption of the SDGs within higher education: an analysis of Latin American scientific associations

Thais Dibbern, Milena Pavan Serafim

[1] University of Campinas (Unicamp)

This paper aims to present how higher education institutions (HEI) can act to achieve the Sustainable Development Goals (SDGs), considering the knowledge production and the public engagement. In this regard, from an exploratory approach, we present an overview on how Latin American scientific associations have been acting towards the adoption of this global research agenda. Methodologically, the paper is developed through bibliographic reviews on the content, as well as through access to documents and official websites of the researched institutions, such as Montevideo Group University Association (AUGM) and Inter-American Institute for Global Change Research (IAI).
Both institutions have a regional academic integration, acting through the promotion of cooperation among their members. One of their main axes of work is the SDGs. In the case of AUGM, institutionalized in 1991, its objective is to contribute to the strengthening and consolidation of a critical mass of high-level human resources, taking advantage of the comparative advantages offered by the capacities installed in the region. About the IAI, created in 1992, they seek to achieve the principles of scientific excellence and integrity, international cooperation, dissemination of science, and capacity building, as well as the full and open exchange of scientific information relevant to global change to realize the vision of a sustainable American continent.
Based on the above, this paper aims to contribute to recent discussions on how the SDGs agenda can be incorporated into the field of education, considering the Latin American experiences.

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Sciforum-048369: The Role of University Extension in the Training of Popular Advisors for the Implementation of Sustainable Development Goals in Times of COVID-19 in the State of Tocantins -Brazil: An Experience Report

Maria da Vitoria Costa e Silva[1], Italo Schelive Correia[1], Matheus Franco Carvalho[2], João Aparecido Bazolli[1]

[1] Federal University of Tocantins
[2] University of Debrecen

This study aims to analyze the action of university extension that promotes the training of popular advisors in SDGs, to act as multipliers in the dissemination of basic knowledge about the 2030 Agenda. The purpose of the analysis is to understand if the qualitative training results of this action are effective in the acceleration of the Agenda. The methodology, with a qualitative approach, is anchored in the hypothetical-deductive method, based on the research technique of analysis of the construction process of the "Popular Advisors Course on SDGs", prepared and organized by master's students from the Graduate Program in Development Regional Federal University of Tocantins (PPGDR-UFT), whose activities are planned to take place in the second half of 2021, in the modality of hybrid study with synchronous and asynchronous moments, with the use of technological resources grouped in e-learning and live stream modes. Preliminary, results show that the extension action has aroused the interest of master's students in knowing the interfaces of the Global Action Plan of the United Nations (UN), with the 17 SDGs and its 169 Goals, as well as they feel motivated to participate in social actions about the rights to the city and in the promotion of use and interactions in the urban space, supporting more humanized, welcoming, and sustainable built environments. The result of this analysis is expected to understand the role of university extension as an effective tool in accelerating the implementation of the 2030 Agenda, becoming a participatory instrument for the insertion of academia in this training process and experiencing the wide dissemination of the theme (SDG) with the formation of multiplier agents.

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Sciforum-048370: University Social Responsibility: From the Perspective of top 10 Universities in Japan

Long Tam Pham

[1] Osaka University

The question about the role and participation of businesses in search for the social balance and environmental protection is not a new concept. Currently, the significant problem is the emerging global consensus that businesses are the engine of economic growth and international development, and that business should play an indispensable role alongside government and communities to solve complex, global challenges like poverty, inequality, unemployment, and climate change. Nowadays, social responsibility has gone far beyond the concept of "philanthropy" in the past, it is now about the strategic contribution to sustainable development and proactive solutions to solve social problems. Sustainable development, to some extents directly relates to education, especially higher education, and its institutions, or, in short, Universities. For all countries, universities play a pivotal role in the development of the society, thanks to their essential function that connects students, staff members, research scholars and business together. Considering universities as corporate entities, the importance of CSR is also transformed into University Social Responsibility (USR). However, because universities obviously have different functions and characteristics so both the framework and implementation of USR must also be amended to effectively carry out its missions. Accordingly, this research aims to examine the USR's current situation of top universities in Japan and develop a comparative research to figure out the pros and cons of USR in different higher institutions.

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Selected talks

Sciforum-031626: Climate Justice: An Applied Approach on a Higher Education Campus

Nicole Weber, Susan Rauchwerk, Sarah Romano

[1] Lesley University

Concern about the global climate spiked to affect 72% of Americans at the end of 2018. Like the student Greta Thunberg, many in the U.S., including our children and students, find ourselves with a sense of panic, and sometimes helplessness. However, this context of ongoing and impending dramatic change to local and global economies, social systems, and ecological landscapes has an upside: there is much opportunity for institutions of higher education to take a leadership role in tackling climate change as an urgent, transdisciplinary issue. Indeed, the City of Cambridge and other educational institutions in our neighborhood are treating it as such. Students across education levels come into our institutions with the trauma of global climate change. They will need the skills to critically and effectively approach these complex social and environmental issues within all sectors of employment. At Lesley, we are focused on student success, social justice, and finding solutions to real world problems. This initiative proposes a way to bridge and integrate our environment as a social and ecological sense of place with the global challenges of climate change. We work to create an campus discussion that would allow us to make connections across disciplinary silos, to see where we have and want to pursue synergies, and create action initiatives. Here is how we have created this discussion within our campus system, where we are now, and where we want to go next.

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Sciforum-048492: Mindful Consumption and De-growth: A Tool of Systemic Change for Sustainable Future

Ashish Agrawal[1], Satyendra Nath Mishra[2]

[1] Founder Director, Bridge4Change Foundation
[2] School of Rural Management, XIM University

Focus
The core to address the issue of sustainability conundrum is to develop actionable decision matrix that harmonizes the roles and responsibilities of three actors, viz., community, state, and market, for the use of available natural resources, facilitated by technology. The COVID-19 pandemic made the world realize that technical solution has limits to the problem faced by human beings. In this backdrop we attempt to scan the foundational systemic change that is needed to reboot the social systems.

Contribution
The primary objective is to explore the core systemic challenges that we humans as society are facing. This exploration involves consultation with key leaders in field development, industry, administration, funders, innovator, etc. The purpose of this step is to find workable links between community, state, and market. During this pandemic time, the first author has done (continuing) more than 1700 hours of research and one-to-one dialogue (on-site and via online mode) with 113 personnel from sixty institutions across 10 domains based in seven countries. The brainstorming session led us to identify that to address the future challenges we must address the issue of mindful consumption and de-growth at individual and collective conscious level, respectively, in our society.
The second objective is to develop action-based 'ecosystem resilience' organizational structure around the identified systematic challenges. This step involves realizing potential partners, action plan to inspire key stakeholders that includes, children's, policy actors, people's representatives, academicians, and business activity.

The author would like to use the 9th World Sustainability Forum (WSF 2021) as springboard to share this idea with wide range of people to create a space for healthy discussion, network, and action plan for better future.

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Sciforum-048327: Promoting education on SDGs via enhanced partnerships and collaborative structured actions at undergraduate level across three institutions located in three continents.

Stella Apostolaki[1], Amani Elshimi[2], Tamo Chattopadhay[3], Helena Maragou[4]

[1] Department of Science and Mathematics, The American College of Greece - Deree, Greece
[2] Department of Rhetoric and Composition, The American University in Cairo, Egypt
[3] Social Sciences Division, American University of Central Asia, Kyrgyz Republic
[4] Dean of School of Liberal Arts, The American College of Greece - Deree, Greece

The current paper presents the processes followed and the outcomes of the Research Collaborative on Global Issues (RCGI) Project, aimed at linking students from three institutions located in three continents, the American University of Cairo, the American University of Central Asia, and Deree—the American College of Greece, in cross-campus groups and at enhancing student learning through shared research and active learning activities on the Sustainable Development Goals (SDGs). The RCGI, currently implemented in spring 2020 and spring 2021, focused on the strategic priorities of promoting "Information and digital literacies" and "Locally grounded forms of digital liberal arts pedagogy and scholarship" on Global Sustainability Issues. Although based on different continents and facing local challenges, especially during COVID-19, the three institutions focused on collaborative inter-institutional academic efforts, highlighting common student learning outcomes, including student peer support, sensitisation to cultural diversity and human similarity, and recognition of contextual privilege and power dynamics, through cross-campus comparative research on better implementing the SDGs.
As part of this exercise the students explored the concepts and necessity to adopt the SDGs and to focus on Agenda 2030, as well as to investigate how to better implement and disseminate the Global Goals on Campus and in wider public audiences, targeting to make societies of the future 'greener' and more sustainable. They conduct research through a problem-solving process which targets at proposing research-based integrative solutions. Furthermore, working in multi-campus virtual teams, the students developed solutions for improved performance on the SDGs in a global perspective while negotiating complexities of local meanings, and embodying interdisciplinary research. Tools and awareness processes have been developed to enable wide dissemination of the SDGs. All outcomes of this endeavour—multimedia artefacts, digitized products—are open access to enable wide dissemination through shared and exhibited digital platforms and globally accessible websites.

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Sciforum-031975: A Crucial First Step: Early Childhood STEM Education for Sustainable Futures

Martin Bascopé[1, 2], Ilan Chabay[3], Carol O'Donnell[4], Janna Pahnke[5]

[1] Pontificia Universidad Católica de Chile, Campus Villarrica
[2] Centro UC de Desarrollo Local (CEDEL UC)
[3] Institute for advanced Sustainability Studies, IASS-Potsdam
[4] Smithsonian Science Education Center
[5] Stiftung Haus der kleinen Forscher

This paper presents a conceptual and operational framework for STEM (Science, Technology, Engineering, and Mathematics) education for sustainable development (STEM4SD) created by an international collaboration of four organizations that provide in-service teacher training with a focus on sustainability. The framework of STEM4SD is key to addressing the critical and urgent need to recognize and develop a sense of personal and community agency regarding climate and sustainability challenges from a very early age.
The paper outlines a scientific-based framework built upon international educational experiences to help scientists, educators, and policymakers conduct and promote early childhood education on STEM4SD. The main points in the proposed framework are:

- **Value-based, holistic, and integrative science for social good**: strongly connecting with the school context, problem, and opportunities; generating opportunities to investigate age-appropriate questions and concerns; and considering local knowledge, expertise, and traditions using inquiry and experiential learning approaches
- **Building awareness, understanding, and agency:** double objective of learning science through inquiry-based learning and generating agency towards local sustainability issues, thereby building an attitudinal and procedural basis to confront complex sustainability challenges
- **Engaging scientists and educators in mutual learning opportunities**: Connecting both areas to enhance the acquisition of empirical science skills in teachers and students and to provide meaningful opportunities for scientists not only to transmit knowledge and transfer skills but also to improve their skills in communicating the basic nature and ideas of science in a clear and appropriate way for children. This may bring the scientists out of their comfort zone, thereby giving them the opportunity to look critically at their work and its social impact.

Details with examples of the specific educational methodologies employed will be provided along with the framework to illustrate ways to instantiate this approach. The paper ends with a critical discussion on the challenges and opportunities in the implementation of these approaches in order to establish awareness of the critical need and urgency to create multi-sectorial alliances to promote these essential changes in our educational systems.

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Sciforum-048026: Developing key competencies for sustainability: A preliminary study on the effective group learning for college students

Ya-ching Chang[1], Hsing-lung Lien[2]

[1] Tamsui Historical Museum, New Taipei City, Taiwan
[2] National University of Kaohsiung, Taiwan

To cultivate our new generations to face the highly dynamic future, UNESCO pointed out seven key competencies for sustainability in education for Sustainable Development. In this study, the objective is aimed at investigating how to develop an effective group learning approach so that students can better engage in learning the future thinking, one of the key competencies for sustainability, in a college class. We examined the effects of students' personality and characteristics using the Lai Personality Test, developed in Taiwan, and the Belbin team roles theory on the learning outcomes of students using a group learning setting in a regular two-credits undergraduate class for a semester. Flow experience questionnaire was also employed to explore how different group activities influence students' engagement. Our data collected from 32 students in the future thinking class revealed that neither personality nor role preferences showed the statistical significance on the students' learning outcomes. Nevertheless, extrovert students (87.4) received relatively higher grade than introverted students (82.3) did. In addition, students with action oriented roles (85.4) or thinking roles (85.8) showed a better performance than those with social roles (77.9). With regard to the flow experience during the group activities, it was found that among three components, i.e., absorption by activity, fluency of performance, and perceived importance, absorption by activity was highly correlated with fluency of performance (r = 0.725, p 0.001) while a moderate correlation was observed between fluency of performance and perceived importance (r=0.473, p=0.004 0.01) based on the Pearson product-moment correlation coefficient. Our study suggested that as a teaching strategy, the group learning is an effective way to enrich the student's ability on future thinking skills. A diversified group may not necessarily ensure a successful learning outcome; however, a proper guidance and curriculum design using such as project-based learning may promote students' collaboration to enhance the overall team performance.

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Sciforum-048459: Sustainable Architectural Education, the Case Study of Green Design in the Architectural Design Studios in North Macedonia

Assoc. Prof. Dr. Viktorija Mangaroska[1], Prof. Dr. Kosta Mangaroski[2]

[1] Faculty of Architecture, IBU University
[2] Faculty of Architecture, SS Cyril and Methodius University, N. Macedonia

Abstract
Cities are hubs for culture, science, ideas, commerce, social, human, and economic development. Sustainable architectural education and green design in the cities, achieves an urgent awareness of the global warming and the effects of climate change, in the extremes of weather and the unexpected flooding in the cities. However, architects must think of sustainability in a new way. The green technology paradigm incorporates the concept of liveability and the aspect how people can adapt to their environment.
The main topic of this scientific paper is the concept of architectural education for sustainable urban development towards SDG11 goal, making cities and human settlements inclusive, safe, resilient, and sustainable. The methodology approach in this scientific paper focuses on defining the measures for architectural education for sustainable human settlements development: adequate sustainable building solutions; sustainable land-use planning; integrated environmental infrastructure; sustainable energy and transport systems; sustainable construction; and human resource development and capacity-building for urban development.
Architectural education for sustainable development is currently very important theme for researching in context of architectural and urban environment. This scientific paper presents the aim and scope of architectural studios and projects developed from undergraduate and postgraduate students of Department of Architecture, Faculty of Engineering at the International Balkan University, Skopje, North Macedonia. Conceptualizing urban areas as sets of intersecting systems provides the basis of architectural study of the structure and organization of sustainable urban systems. Specific attention in this research will be given to analysis of ecological design process and green architectural paradigm with consideration of their urban context, adequate public access and architectural space. The expected outcome results in this scientific paper is to identify the green design approaches and create application at the international education processes as key elements of sustainability architectural education.

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Sciforum-048405: Evaluating the Effectiveness of PEAR, an Augmented Reality Serious Game Promoting Individual Environmental Action

Kyra Wang, Zeynep Duygu Tekler, Lynette Cheah, Dorien Herremans, Lucienne Blessing

[1] Singapore University of Technology and Design

While public awareness of climate change has increased over the years, people still have major misconceptions regarding effective individual environmental action. In this paper, we present a serious game called PEAR developed using elements of geolocation and augmented reality (AR), aimed at increasing players' awareness of climate change issues and propensity for effective sustainable behaviors. We also outline a study conducted with human participants who played the game, gauging the participants' knowledge of and attitudes towards climate change issues before and after playing the game. Our results show that the game significantly improved participants' knowledge on sustainability and climate-change-related issues and that it also significantly improved many attitudes towards sustainability and climate change. We additionally show that there does not appear to be a significant correlation between pre-existing attitudes and knowledge absorption during the game, indicating that self-selection bias and non-random sampling do not have a significant effect on the results for knowledge absorption and that the game would be effective for the general population.

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Abstracts

Session EN. Energy

Posters' abstracts

Sciforum-031022: Beware of side effects? Spillover evidence from a hot water intervention

Alexander Götz, Harald Mayr, Renate Schubert

[1] ETH Zurich

Behavioral interventions may have unintended side effects. We study the effects of a hot water saving intervention on the consumption of cold water and heating energy in a randomized controlled experiment in 782 buildings. The intervention reduces hot water consumption by 6.02%, as compared to baseline consumption. Beyond this effect on the target behavior, we find a 5.58% decrease in heating energy consumption and a 2.57% decrease in cold water consumption. The spillover on heating energy conserves substantially more energy, utility costs, and externalities, than the targeted hot water savings. Our results suggest that behavioral interventions in the residential domain may have large benefits that are usually uncounted. At the same time, treated households may incur higher costs (e.g., financial, comfort, or psychological costs) than previously thought.

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Sciforum-048461: Influence of the electrical grid connection on the Utility Scale Wind farms implementation in Tunisia

BachiriI Badiaa[1], Faten Attig Bahar[2]

[1] Pan Africa University, Institute of Water Energy Sciences, Energy department
[2] Applied Mechanics and Systems Research Laboratory (LR03ES06), Tunisia Polytechnic School, University of Carthage,B.P. 743, Al Marsa 2078, Tunis, Tunisia

Being a signing part of the Paris agreement, Tunisian authorities adopted a strategy to reduce its dependence on fossil fuel and started to diversify its energy mix in order to meet its ambitious renewable energy plan of 2030. Wind energy, as a component of the green transition, has been given a lot of attention since 2009 in the country. Moreover, the good wind energy potential is one of the motivations to develop the wind energy sector in the country.
In fact, the wind power density in the north and the south-eastern region of the country is between 820 W/m and 774W/m, respectively.
In this paper, we present a prospect and an analysis of the current situation of the national electrical grid in Tunisia, which represents a limitation among others, on the exploitation of the renewable energy in the country and we conclude that the current grid connection could only allows us to use less than 5 % of the available wind potential if we aim to implement utility scale wind farms in the country. It is also worth mentioning that in addition to the grid connection, other parameters could influence energy production, such as the land availability, the terrain topology, and the real weather surveys.

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Sciforum-031248: Assessment of carbon reduction benefits of biogas power generation by life cycle-based carbon footprint analysis: A case study in Taiwan

Hsing-Lung Lien[1, 2], Jyun-Ting Chiu[1]

[1] Department of civil and Environmental Engineering National University of Kaohsiung, Taiwan
[2] New Energy and Electricity Development Center (NEED Center) National University of Kaohsiung, Taiwan

Biogas is classified as one of the renewable energy in Taiwan's renewable energy development regulations. Biogas contains methane that possesses global warming potential of 25 relative to CO2. Thus, the use of biogas for the electricity generation is an environmentally friendly approach. In this study, a biogas-based electricity generator with an installed capacity of 195 kW was constructed at a swine farm with the capacity of 40,000 pigs in Taiwan. The total electricity generated was 582,475 kWh in 2018. The carbon dioxide equivalent emission by the biogas power generator was 925,858 kg, corresponding to the carbon footprint of 1.11 kg CO2-eq / kWh in 2018. When the life cycle assessment was taken into account in the carbon emission inventory of this specific case, the total carbon dioxide equivalent emissions were in the range of 1,064–1,288 tons CO2-eq and carbon sequestration by the soil carbon fixation was 224,264 kg CO2-eq. The overall biogas carbon footprint was 1.279 kg CO2-eq/kW.

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Sciforum-048422: Exploring Wind Energy Resources: Scopes and Feasibilities for Renewables in Bangladesh

Mariam Hussain

[1] Climate and Energy Systems Engineering, Ewha Womans University, Seoul, Republic of Korea

Modern lifestyles and economic growth depend significantly upon energy. The accessibility and affordability to energy in a developing country, such as Bangladesh are challenging. The majority of energy is from conventional sources, such as natural gas (54%), furnace oil (27%), and coal (5.6%). For sustaining development activities and accelerating gross domestic products, renewable energy needs an emphasis on future energy security. This paper aims to investigate the feasibility for wind power harvesting and a benchmark to incorporate the latest turbine technology. The study-sites are four cities: Chittagong and Khulna as coastal regions, Rajshahi, and Dhaka as riversides. Approximating to hub height, wind speed at 90m obtains from ECMWF reanalysis version5 (ERA5) monthly data for 40 years from 1979 to 2018. Based on descriptive statistics, climatological analysis shows a gentle wind speed throughout years, i.e., 4.1 and 3.28, respectively, for coastal and riverside regions. The wind anomalies pattern prove that the deviation in intensity is about ± 0.8 m/s. Though the paper limits climatological calculations from model data, the findings suggest both coastal and riversides have potential for harvesting wind energy. It is noteworthy that the results show that higher wind intensity produces more accurate observations than model averages. Moreover, the paper also reviews national transport and gridlines for customizing efficient modern wind technology, i.e., Vestas-2 Megawatt (MW) turbine. The incorporation of modern technology (a single turbine) could provide 6000 to 8000 MWh of clean energy, i.e., feasible for meeting the surplus and future energy demands.

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Sciforum-030964: How Do Configuration Shifts in Fragmented Energy Governance Affect Policy Output? A Case Study of Changing Biogas Regimes in Indonesia

Ibnu Budiman

[1] World Resources Institute Indonesia

Biogas technology to support rural livelihoods and low-carbon development has been developed in different projects and programs in the Global South over the last few decades. However, the existence of multiple projects, actors, and designs involved may lead to so-called fragmentation in governance. This research addresses the fragmented governance amongst the biogas programmes in Indonesia to study their impact on the implementation; the numbers of biodigesters disseminated and knowledge transferred. Drawing on concepts of fragmentation, regime effectiveness, and policy output, the research uses data from interviews with relevant actors, supplemented with documents review. Findings show that the governance architecture of biogas regime in Indonesia consists of different types of biogas programmes championed by different types of actors pursuing different objectives. There had been patterns and periodical shifts of configuration within the Indonesian biogas regime, i.e., from administrative fragmentation (2007–2009), to conflictive fragmentation (2010–2012), to cooperative fragmentation (2013–2016), and reduced fragmentation (2017). Shifting from administrative to cooperative fragmentation resonates with the increase of the number of biodigesters dissemination more than fourfold in ten years, from 800 in 2007, to 37,999 in 2016. The distribution of power within the governance architecture among government bodies, NGOs, and the private sector influenced the speed of implementation and innovation of the biogas programs. This suggests that a higher degree of distribution of power and cooperation within a governance architecture contribute to increasing policy output of the regime complex of renewable energy.

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Sciforum-047429: Influence of the atmospheric circulation type on solar energy potential

Małgorzata Pietras-Szewczyk

[1] Lower Silesia University

The main goal of this study is an analysis of the influence of atmospheric circulation conditions on the solar energy potential. The circulation conditions in south west Poland was analysed by Dubicka (1994) according to the classification of circulation patterns proposed by Osuchowska–Klein (1978).
The classification distinguishes following types of the atmospheric circulation types: Type A – westerly cyclonal circulation; type CB – north-westerly circulation; type D – south-westerly circulation; type B – southerly cyclonal circulation, type F – south-easterly circulation, type C2D – westerly anticyclonal circulation; type D2C – south-westerly and stoutly anticyclonal circulation; type G – central anticyclonal circulation; type E2C – north-westerly anticyclonal circulation; type E0 – north-easterly and easterly cyclonal circulation; type E – north-easterly anticyclonal circulation; type E1 – south-easterly and easterly anticyclonal circulation.
Solar radiation is closely related to atmospheric circulation and weather phenomena. However, the crucial element of this study is to provide that atmospheric circulation type can by useful to prognosis solar energy potential. For this purpose, measured data from Wroclaw meteorology observatory was analysed and compared with certain circulation types. Then the impact of atmospheric circulation on efficiency of solar energy income was calculated.

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Sciforum-031345: Organizational eco-innovation and strategic decision making as enhancements towards achieving affordable and clean energy in Malaysia

Russell Tatenda Munodawafa, Satirenjit Kaur Johl

[1] Universiti Teknologi PETRONAS

Greenhouse gas (GHG) emissions, such as methane (CH_4), nitrogen oxide (N_2O), carbon dioxide (CO_2), and various fluorinated gases, have been on the rise, posing a potential threat to the long-term sustainability of the natural environment. GHG emissions mitigation strategies are needed to address these challenges. Eco-innovations have the potential to simultaneously drive positive economic development and minimize harm to the environment. As the energy sector is at the forefront of economic development, it may broaden its perspective by adding people and planet to its developmental equation vis-à-vis sustainable development. The energy sector needs to introduce innovations that minimize harm to the natural environment and society, whilst improving economic performance. However, eco-innovations such as combined heat and power systems are a potentially risky business proposition due to their uncertainty. Organizational eco-innovation systems provide organizational strategic decision makers with information to support their eco-innovations. Therefore, data are collected from Malaysian energy sector firms to understand how novel organizational eco-innovation systems implementation may be useful in the performance of energy sector firms. Results from our analysis suggest that performance of firms active in the energy sector can potentially benefit by greater and rapid implementation and deployment of organizational eco-innovation. Organizational eco-innovation systems enable energy firms to make better decisions, which minimize the risk associated with eco-innovation and buttress the drive towards attainment of the Sustainable Development Goals (SDGs) by the energy sector.

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Sciforum-048411: SAFmaps: A Geospatial Database for Sustainable Assessment of Biofuels Production

Marjorie Mendes Guarenghi[1], Arnaldo Walter[1], Joaquim Seabra[1], Jansle Rocha[1], Nathália Vieira[1], Desirèe Damame[1], João Luís Santos[2]

[1] Unicamp
[2] Geomeridium

Bioenergy has the potential to contribute to climate change mitigation. Moreover, the promotion of bioenergy is an opportunity to enhance sustainable development, provided that aspects such as potential environmental and social impacts are properly considered in the design process. This poster aims to present the SAFmaps platform, an open-access geospatial database with information on the most promising feedstocks for the production of sustainable aviation fuels (SAF) in Brazil. Despite having been built to provide information to potential investors in the production of SAF, the platform can be used in a variety of applications. SAFmaps provides georeferenced data about the suitability, potential yields, and estimated costs for bioenergy crops as eucalyptus, soybean, palm, macaw palm, sugarcane, and corn. The geographic coverage corresponds to about 50% of the total Brazilian area. Information includes the availability of beef tallow and steel off-gases. The user can also access background maps on biophysical conditions, land prices, land use/cover, pasture degradation, protected areas, and potential socioeconomic issues (i.e., reported violations on land use and water use rights). Existing and planned infrastructure data (i.e., roads, railways, pipelines, energy conversion units) are available and can be used for further analysis regarding biomass transport. The results of six case studies are also available.

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Sciforum-047525: Understanding the Interactions between the Low-Carbon Agenda and the Sustainable Development Goals Agenda

Fernanda Silva Martinelli[1], Lisa Biber-Freudenberger[2], Jan Börner[2]

[1] University of Bonn
[2] Center for Development Research, University of Bonn

The 17 Sustainable Development Goals are recognized as a framework to advance sustainability worldwide. Because the goals are interdependent and context-dependent, their interactions under different policy environments have potential implications for the local implementation of the agenda. While past analyses have studied the interactions in theoretical situations, the accuracy increases when we assess the interactions in a specific geography, governance arrangements, and technological options. In this paper, we analyze the complex synergies and trade-offs of low-carbon energy strategies and SDGs, focusing on the largest Brazilian biofuel policy. We present an approach that identifies potential causalities between SDG targets, uncovering both synergies and harmful trade-offs in the implementation of the policy. Based on a map from surveys with experts using the seven-point scale of SDG interactions, the analysis identified that the interaction scale is tipped to the positive-neutral side, with specific energy- and climate-related targets reinforcing each others' progress, suggesting where important cross-sectoral collaboration between departments is needed. Agriculture income and biodiversity targets had the most negative influence on the policy context, and thus, extra efforts may be directed there during the implementation of the policy. Lastly, the analysis revealed the differences in expectations among experts according to their social position. This study fills a gap in the SDG policy dialogue by providing a more concrete understanding of what is required for integrating the biofuel policy with the Agenda 2030, optimizing resource use, and generating more sustainable outcomes.

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Selected talks

Sciforum-048338: Technoeconomic and environmental assessment of marine biofuels

Lucas Cesilla de Souza[1], Joaquim Eugênio Abel Seabra[2]

[1] MSc Candidate in Energy System Planning at the University of Campinas (Unicamp)
[2] Professor Dr. at the Department of Energy, School of Mechanical Engineering, University of Campinas (Unicamp).

International shipping is an essential component of the global economy. In 2018, in accordance with SDG 13, the International Maritime Organization (IMO) set targets to reduce total annual greenhouse gases emissions and has also been restricting the limits of SOx and NOx emissions from ships, reducing health impacts on coastal populations. In this context, biofuels are an alternative to meet these targets. This work compared the life cycle environmental performance and the technoeconomic performance for a conventional ship equipped with a two-stroke diesel engine powered by low-sulfur fuel oil with a vessel powered by biofuels such as hydrotreated vegetable oils produced from palm and soy, hydrotreated fast pyrolysis oil, and green ammonia, all produced from sugarcane and eucalyptus residues. It was also considered an alternative ship equipped with solid oxide fuel cell, powered by hydrogen produced from on-board reform of sugarcane ethanol and green ammonia. The life cycle assessment was carried out in the Brazilian context using the well-to-propeller approach. The technoeconomic assessment considered the CapEx and OpEx for the entire ship based on estimates from the literature. The study discussed the role of Brazilian biofuels to achieve IMO's goals, especially in view of the 2030 Agenda.

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Sciforum-032043: A cascade model and initial exploration of co-production processes underpinning the ecosystem services of geothermal areas

David Cook, Brynhildur Davíðsdóttir, Laura Malinauskaite

[1] University of Iceland

Although lightly explored in the academic literature, geothermal areas supply an array of ecosystem services (ES) of benefit to human well-being, many of which rely on co-production processes. Especially in relation to the cultural ES of geothermal areas, the benefits involve positive perceptions in the minds of human beings, who experience cognitive appreciation of the various surface-level geophysical and geo-chemical manifestations common to such areas. This paper presents the first study in the academic literature to explore, using examples from the academic and grey literature, the various stages in the formation of geothermal ES and their interactions between the biosphere and the anthroposphere. This is achieved through the development of the first ES cascade model in the academic literature specific to geothermal ES, which also integrates the four main stages of co-production: value attribution, mobilization of ES potential, value appropriation, and commercialization. In so doing, conceptual understanding of human-environment relationships and processes in the context of geothermal ES are deepened. Often, realization of the full spectrum of benefits from geothermal areas demands the mobilization of various forms of physical capital. Reaping the benefits of provisioning ES, such as heat and minerals, or formal recreational experiences, such as geothermal spas, necessitates human interventions. Opportunities of likely value have to be attributed, with resources being mobilized in order to plan and research prospectivity, then benefits appropriated with a view to their commercialization. Large-scale, industrial projects, especially geothermal power plants in high-temperature fields, also constitute an overlap between anthropogenic and ecological systems, often leading to ES trade-offs, especially due to visual and noise impacts on the surroundings. Depending on the socio-cultural context, multiple and conflicting value domains may be impacted by such ventures, justifying the adoption of a pluralist approach to valuation and use of integrated decision-support platforms to aid decision-makers.

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Sciforum-048286: Large scale solar or palm biodiesel? A comparative life cycle assessment for renewable energy landscape in Malaysia

Phuang Zhen Xin, Lin Zuchao, Woon Kok Sin

[1] School of Energy and Chemical Engineering, Xiamen University Malaysia

Being the world's current second-largest palm oil and third-largest solar photovoltaic cells and modules producer, Malaysia prioritizes the development of palm biodiesel (PB) as biofuel and large scale solar (LSS) as electricity source to meet the national 20% renewable energy capacity target by 2025. Nevertheless, the heated controversies doubting the efficacy of both technologies in reducing environmental impact nowadays are not backed with data-driven insight. Therefore, this study aims to determine the environmental hotspots and compare the environmental impact caused by the 'cradle-to-grave' life cycle of the PB production and LSS system using life cycle assessment (LCA) methodology. Both technologies are assessed from raw material extraction processes to product consumption with ReCiPe 2016 characterization method in SimaPro 9 software. The damage assessment proved that LSS systems performed more favourably than PB systems up to 77% in the selected damage categories. The environmental hotspots in PB are fresh fruit bunch production stage and milling stage while electrical installation stage is the environmental hotspot in LSS systems. The integration of material recovering processes, such as aluminium recycling in LSS systems and crude palm kernel plant and anaerobic digestion biogas plant in PB system in PB system, can potentially reduce global warming by 40% and 6%, respectively. Policy implications are recommended for policymakers and relevant stakeholders for better decision-making aligned with the national renewable energy implementation road map.

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Sciforum-047919: National SDG-7 Performances in an Absolute Sustainability Perspective

Caroline Gebara, Alexis Laurent

[1] Division for Quantitative Sustainability Assessment, Technical University of Denmark, Kgs. Lyngby, DK

The United Nations' Sustainable Development Goal 7 (SDG-7) aims to "ensure access to affordable, reliable, sustainable and modern energy for all". The goal is translated into three outcome-oriented targets defined as (7.1) ensuring universal access to affordable, reliable, and modern energy services, (7.2) increasing renewable energy share, and (7.3) double global rate of energy efficiency improvement. To monitor the progress towards SDG-7, a number of indicators has been proposed in the literature, as well as by different international working groups. However, these are all limited to socio- and techno-economic aspects, and indicators related to environmental aspects are largely omitted. Furthermore, these indicators currently assess performances in relative terms, for example comparing one year with previous years, while performances benchmarked to 'absolute sustainability' thresholds or targets, reflecting truly environmentally-sustainable states or desired societal targets, have not been assessed. Defining such thresholds or targets are essential for defining whether energy sectors are moving toward absolute sustainability or not. To overcome these limitations, we developed a holistic SDG-7 assessment framework, which we applied to 48 countries and regions covering the entire world. The framework's main features include 1) a comprehensive set of 29 SDG-7 indicators containing both environmental and socio- and techno-economic and indicators, 2) a normalisation step that allows for benchmarking the indicators against absolute sustainability thresholds and targets, for which we provide estimates at global and national level for the energy sector. Our results from the framework application reveal that none of the countries and regions currently perform sustainably, particularly with respect to environmental indicators (e.g., climate change and land use impacts). Additionally, trends show that most high-income countries perform poorly with respect to the environmental indicators and relatively good with regard to the socio- and techno-economic indicators. In contrast, for the low- and middle-income countries, a reverse tendency is observed. Beside the country-specific results, which enable identification and prioritisation of effort needs, the framework illustrates the need for assessing SDG-7 in a holistic and absolute perspective to provide a more science-based and effective decision-support to energy stakeholders. We, therefore, recommend a wide application of our framework to evaluate the performance of SDG-7 and, more generally, to accumulate knowledge in SDG performance assessment to build upon in further research.

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Sciforum-031387: Optimizing Sustainable Energy Planning Due to Sustainable Energy Balances and SDG-Based Indicators

Volker Stelzer

[1] Karlsruhe Institute of Technology

We are currently undergoing a profound change from the "old energy world", which is characterised by large fossil fuel power plants, refineries, and gas pipelines, to a "new energy world"characterised by greater decentralisation, the use of renewable energy sources, and extensive sector coupling. This greater socio-technical complexity poses considerable challenges for energy infrastructure planners. The preparation of a national "sustainable energy balance sheet" could be a supporting tool in this context. "Sustainable energy balance" is a method to determine the extent to which the country could become self-sufficient on the basis of local renewable energies. This information can help to ensure that the right decisions are made at an early stage to create meaningful new energy infrastructures. However, it is not enough to carry out an assessment of the technical and economic potential of the various renewable energy sources in order to help the population to make the transition to the new energy future, as the use of renewable energies can also have side effects that can slow down the energy transition. Examples include the killing of bats by wind turbines, terrain uplift through geothermal energy use, and groundwater pollution through bioenergy crop cultivation. For this reason, energy potentials should be subjected to a sustainability assessment using the Integrative Concept of Sustainable Development (ICoS) and the SDGs. This can be used to determine how high the socially accepted potential of renewable energy sources is. This can lead to a significantly improved "energy balance of the future" as a "sustainable energy balance" (SEB). In this paper, the methodology for the determination of the SEB is presented.

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Sciforum-048386: Smart ubiquitous sustainable Blue-Green energy management towards a new concept SME 5.0/Hybrid SME through the 5th wave theory

Prof. Dr. Hamid Doost Mohammadian

[1] Fachhochschule des Mittelstands (FHM), Bielefeld, Germany

We are living in an era that the world confronts global and urbanization challenges, such as environmental concerns, climate change, poverty, slums, economic challenges, social instability, health challenges, and so on. It is vital to deal with these challenges to maintain the world and environment for future generations, as well as improving liveability and quality of life at present. Sustainable development is introduced as a path to deal with these challenges and create more liveable and sustainable world. Different paths and techniques could be applied to achieve sustainable development through sustainable and smart cities. Therefore, smart and sustainable cities and countries could deal with global challenges, even making the world as a better place for living. Since we reached the 1970s the technologies and IT became able to influence, change, and improve the various energies, business, and even impact our lives. In addition to this, they can change the global policy from fossil energy and coal to sustainable renewable energies. In these days, technology and technologies based on information technologies would play significant roles in creating solutions and techniques towards sustainable development. Hybrid businesses and SMEs (SME 5.0), ubiquitous cities, digital cities, smart citizens, ubiquitous, and intelligent services, including smart mobility, ubiquitous, and smart education, and so on, are main solutions based on technologies towards sustainable development through the 5th wave theory (Doost, H. 2010-17) and seven pillars of sustainability model (7PS model).
One of tools based on technologies could influence on developing sustainability is smart and sustainable energy management that is declared as Ubiquitous Digital Blue-Green energy management by authors. Sustainable Digital Blue-Green energy management founded on renewable energies as well as environmentally friendly strategies, sustainable water management, and sustainability pillars could reduce environmental challenges like air pollution, water contamination, water shortage, climate change, resource preservation, environment maintenance, and so on; towards improving environmental sustainability that is a necessary indicator for sustainable development and existing of liveability in this world in future. Fundamentally, Ubiquitous Blue Green Energy Management could develop sustainability through its advantages such as: applying renewable energies, energy efficiency, improving energy security and energy quality, preserving natural resources, being accessible at anytime and anywhere, reducing environmental concerns, cost reduction, improving productivity and efficiency of a business, controlling and managing business processes towards reducing risks, developing successful business with high efficiency, productivity and sustainable cities. Fundamentally, Ubiquitous Blue-Green energy management as a component of urban infrastructure is able to create Ubiquitous Smart Blue-Green city where sustainability, high quality of life and liveability are existed. Such urban areas could supply human's needs and make high quality of life, as well as sustainable development.
In this article, Smart innovative Blue-Green energy management and how it could be developed are illustrated and it covers:

- Ages and Waves;
- High Technologies including Intelligence Artificial, Machine Learning, and Robotic;

- Technologies such as Virtual Reality, Smartness, Digitalization, Technologies based on Internet and Information;
- Ubiquitous such as Ubiquitous Computing, Ubiquitous Infrastructure and Ubiquitous City;
- Fossil Fuels;
- Renewable Energies;
- Future of Energies;
- Energy Management;
- Sustainable and Smart Energy Management;
- Blue-Green Strategies;
- Ubiquitous Blue-Green Energy Management and its Benefits;
- Different Tools and Techniques towards Ubiquitous Blue-Green Energy Management including Risk Management, Resource Management, Technologies, Innovations;
- Case Studies: South Korea as Ubiquitous and Germany as Digital Country;
- Relation among Ubiquitous Blue-Green Energy Management and Sustainable Development.

In particular, Ubiquitous Digital Blue-Green Energy Management is a technique to create sustainable, smart, and liveable urban areas, as well as sustainable environment. Therefore, it is vital to introduce and illustrate it in order to apply it more towards Ubiquitous Blue-Green cities that are able to make the world as a better place for living.
This paper is based on the newest updated relevant articles, books, the experience of me and some other sustainability and energy management leadership that is my main focus in the concept to bring target point of each item to prevent any time and resource wasting to whom they want to read and follow sustainable and smart energy management subjects.

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Abstracts

Session FAS. Food, Agriculture and Soil Sciences

Posters' abstracts

Sciforum-048264: Miang Culture and Sustainability in Mae Kampong, Thailand

Tamonwan Chankaew[1], Panchana Charaj[2], Piyatida Panitsupakamol[1], Chalermpong Saenjum[3, 4, 5], Dujrudee Chinwong[1, 6], Surarong Chinwong[1, 6]

[1] Department of Pharmaceutical Care, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand
[2] Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand
[3] Department of Pharmaceutical Sciences, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200
[4] The cluster of Excellence on Biodiversity-based Economic and Society (B.BES-CMU), Chiang Mai University, 50200, Thailand
[5] Research Center for Multidisciplinary Approaches to Miang, Chiang Mai University, Chiang Mai, 50200, Thailand
[6] The cluster of Excellence on Biodiversity-based Economic and Society (B.BES-CMU), Chiang Mai University, 50200, Thailand;

Mae Kampong village, a famous tourist destination in northern Thailand, has its own sustainable culture called *Miang* culture. *Miang,* or fermented Assam tea leaf, has been a part of the Mae Kampong community for centuries. Furthermore, *Miang* agriculture is not only for the purposes of consumption but also for the environment. According to Sustainable Development Goals, *Miang* can create sustainable communities and life of land by creating a career for villagers, and the *Miang* cultivation itself can preserve the environment. Therefore, this research aimed to study the *Miang* consumption and agriculture in the Mae Kampong community and its relation to the Sustainable Development Goals. This research took place in Mae Kampong Village, Chiang Mai, Thailand. This study was conducted as a cross-sectional and qualitative study. Mae Kampong villagers mostly consume *Miang* as a staple food such as *Miang* salad or concentrated *Miang* condiment. Additionally, *Miang* is also consumed as a snack by chewing. *Miang* cultivation is the main source of income in some households; it can be sold in the original form or processed into goods such as a healthy baking or tea pillow. *Miang* in the Mae Kampong community acts as a staple food to feed the community and as a source of income for those seeking sustainable life. The community has integrated *Miang* into their lifestyle, leading to sustainable development.

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Sciforum-048115: Use of Microwaves for the Improvement of Corn Seeds

Patricia López-Perea, Mariela Rodríguez-Ramos, Elba Ronquillo de Jesús

[1] Ingeniería Agroindustrial, Universidad Politécnica de Francisco I. Madero.

In Mexico, the cultivation and use of corn are essential for culture, which ranges from gastronomy to religious acts. On the other hand, Mexico is the origin of this cereal, and it is desired to conserve biodiversity without using biotechnological tools. This project aimed to evaluate the effects of microwave irradiation on corn seeds and, in turn, on their growth. Microwave irradiation was carried out using a conventional DAEWOO brand microwave oven model KOR with a power of 600W; the blue and soft corn seeds were exposed to 0, 4, 8, and 12 s of heating. Subsequently, they were sown, and their agronomic development was observed for seven weeks. According to the results obtained, it was shown that exposure in short periods generates more excellent germination and growth viability of this plant. Among the corn varieties, the blue corn variety was more resistant to environmental conditions and more significant growth. The best treatment was microwave irradiation at 8 seconds, where an increase in plant development was observed.

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Sciforum-048439: Can Millet provide Nutritional and Food Security and promote Sustainable Agriculture? Evidence from Odisha, India

Karishma Rana[1], Minati Sahoo[2]

[1] ph.d scholar
[2] Asst. professor

Global warming, climate change, poverty, and population growth are some of the global problems faced by contemporary society which forced the policymakers to shift their priority from growth and affluence towards equitable distribution, and proper utilization of resources for sustainable development. The rising population, increase in income, and standard of living will raise the demand for food. All these may again cause global threat to food and nutrition securities. According to World Bank report, 689 million people are still living below $1.90 per day and three million undernourished people need to be lifted from hunger and malnutrition every single month to achieve the sustainable development goal. In addition, unpredictable climatic change and extreme weather conditions put pressure on food and nutritional securities by reducing the production of mainstreamed agriculture like rice, wheat. Therefore, we need to shift our focus towards more environmental resilience and climate-smart crops for sustainable agriculture. The role of millet as a sustainable crop substitute on affordable price cannot be ignored especially in states like Odisha, where more than half of the population depends on agriculture. Additionally, the state suffers from another major challenge, i.e., 52% of the adolescent girls aged 15–18 years are chronically undernourished and 51% of women aged 15–49 years are anaemic. Therefore, there is a need to shift the focus towards more environmental resilience and climate-smart crops and cereals to provide nutritional food to more mouths, and millet in this regard can be considered as a sustainable crop substitute on affordable price. Hence, an attempt has been made in this study to analyse the role of millet in providing food and nutritional security and promoting sustainable agriculture. This will help the government to devise an appropriate strategy to address the issue of malnutrition and food insecurity.

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Sciforum-047546: Cassava fibre supplementation maintains glucose homeostasis and counteracts high sugar diet-induced metabolic syndromes

Rakhi Chacrabati, Md. Kamrul Hasan Kazal, Ohi Alam, Moriam Hossan, Romana Jahan, Khadiza Khatun, Chayon Goswami

[1] Bangladesh Agricultural University

Metabolic syndrome is a burgeoning global problem among the urban populations of some developing countries. The prevalence of metabolic syndrome in Bangladesh has increased dramatically in the last few decades. High sugar diet consumption has been reported to accelerate the development of metabolic disorders, such as diabetes and obesity. Beneficial effects of dietary fibre, such as prevention of obesity, improved glucose levels, and control of the profile of blood lipids, have also been reported. Cassava tuber contains a remarkable amount of dietary fibre, which consists mainly of uronic acid, pectin, β-glucans, cellulose, and lignin. Therefore, we designed this experiment to reveal the potentiality of cassava fibre (CF) to maintain glucose homeostasis, as well as to evaluate the beneficial effect of cassava fibre to prevent the development of diabetes and obesity caused by a high-sugar diet. Swiss albino male mice were fed cassava fibre (CF) in supplementation with or without high sugar diet (HSD) for a period of 24 days. CF supplementation gradually reduced food intake in comparison to a high sugar diet group from the 5th day of the treatment. Though it was insignificant, supplementation of CF counteracted the increase in body weight due to high sugar diet intake. From ipGTT, it was revealed that CF supplementation inhibits the rise in blood glucose level at 15 min after the intraperitoneal glucose (2mg/kg BW) challenge. The area under the curve (AUC) was also significantly lower in CF supplemented group as compared with that of only HSD fed group. A significant decrease in liver weight was observed in the HSD+CF group in comparison to HSD group. CF supplementation also significantly decreased LDL-cholesterol concentration than the HSD-fed mice. However, no significant difference was found in serum cholesterol, triglycerides, and HDL-cholesterol among the groups. Overall, our present study showed that the intake of a CF-enrich diet is beneficial to maintain glucose homeostasis and counteract the development of metabolic syndromes associated with diabetes and obesity.

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Sciforum-034287: Changes in polish agriculture in a view of SDGs

Agata Kosieradzka-Federczyk

[1] Cardinal Stefan Wyszyński University in Warsaw (Poland)

The Polish policy on agriculture changed significantly after the period of transformation in late 1980s. Small family farms have been slowly turning into large farms.
On the one hand, the total number of farms (of which there are 1,405,700—data from 2017) is dominated by small farms of 1–10 hectares. According to the data of the Central Statistical Office for 2017, they account for about 75% of the total number of farms, but only about 28% of the agricultural area is in their use. Other farms are typically entrepreneurs.

Poland remains a significant producer and exporter of food. This results in an intensive use of the soil as a natural resource. Intensive fertilization negatively affects biodiversity.
The topic of the speech is to present the policies of successive governments to encourage sustainable agriculture.

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Sciforum-048319: High performance liquid chromatographic profiling of isoflavones and soluble carbohydrates in soybean seeds for sustainable and successful breeding programs

Edward Muntean[1, 2], Camelia Urda[2], Raluca Rezi[2]

[1] University of Agricultural Sciences and Veterinary Medicine Cluj Napoca, Romania
[2] Research & Development Station for Agriculture, Turda, Romania

High performance liquid chromatography (HPLC) is nowadays the method of choice for the separation of components from mixtures, being one of the most popular, modern, powerful, and versatile separation techniques that have been routinely used to separate, identify, and quantify analytes, as well as to obtain the chemical profile or fingerprint of a wide varieties of samples. Soybean is one of the most important crops grown worldwide for food, feed, and fuel, as well as for obtaining numerous chemical products. As soybean is becoming more appealing for human consumption because of high nutritional value and health-promoting traits, breeding for improved protein, fatty acid, and soluble sugar compositions, as well as for increased isoflavone content is gaining importance. Soluble carbohydrates are major components of soybean seeds, with sucrose and stachyose being the predominant ones; the profile of these compounds determines the quality, digestibility, and nutritional value of soybean for food and feed. Soybean is in the meantime one of the most important natural sources of isoflavones in the human and animal diet; isoflavones are important phytoestrogens, being associated mainly with women's health and increasingly used in dietary supplements. In this context, the major aim of this research is to provide a combined approach of HPLC techniques, able to provide the profiles of isoflavones and soluble carbohydrates in order to assist the breeding programs in a study in which different soybeans genotypes were tested in order to find both the quality attributes and the best candidates for developing new varieties. Soybean seeds originating from cultivars harvested from the Research and Development Station for Agriculture, Turda were used in this study. A reliable, fast and sensitive HPLC method has been developed and optimized for the analysis of isoflavones, being accomplished with a Perkin Elmer Flexar UHPLC system with UV detection, enabling the separation of genistein, glycitein, daidzein, daidzin, glycitin, and genistin in less than 9 minutes. HPLC separation of glucose, fructose, saccharose, raffinose, and stachyose was accomplished on a Shimadzu Prominence system with differential refractive index detection, on which the separations were performed in 22 minutes. Autoscaled preprocessed chromatographic data were further subjected to principal component analysis using Matlab (MathWorks Inc., USA); the resulted model revealed both the genotypes with the best quality attributes and similarities between the studied ones, helping in decision for selecting the most appropriate ones for creating new soybean lines. The proposed approach can be considered as an efficient tool for sustainable and successful breeding programs targeted to creation of new genotypes, with improved isoflavones and soluble carbohydrates content.

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Sciforum-047409: Policy evolution and the economic and financial impact of decarbonizing agriculture on food security

Adela Sorinela SAFTA, Lavinia Popescu

[1] Bucharest University of Economic Studies, Bucharest, Doctoral of Economic School

The paper presents a holistic analysis of the scenarios expected in the implementation of the new conditions imposed in the CAP. At European level, it is estimated that climate change will have an increasing impact on food and security. According to Iglesias et al. (2007), it is estimated that global warming will generate mixed and unevenly distributed effects across the EU. the potential impact of climate change on the agri-food sector is a complex task. For example, according to Olesen et al. (2011), climate change affects crop production in several ways—both directly and indirectly. It has been realized that the natural resources, which society needs and which are limited, have been exceeded, while creating an ecological imbalance on a global scale, through irresponsible economic growth. Agriculture occupies an important place in the Romanian economy and has considerable prospects for development in the European context, due to favorable soil and climate conditions and potential in the field of organic production with a significant impact on the decarbonization of agriculture. In Romania, agricultural land occupies about 62% of the total area with about two thirds of 13.3 million hectares, considered very productive arable land, used especially for the cultivation of corn and wheat. With the reform of the CAP in 2013, reducing GHG emissions and adapting to climate change have become one of the cross-cutting objectives to be pursued by all Member States, through all measures to support agriculture. The new direct payment scheme requires Member States to spend a minimum of 30% of the national financial envelope on "greening" activities: crop diversification, maintaining permanent pastures, and maintaining ecological concentration areas. Romania's National Rural Development Program (PNDR 2014–2020) offers a strategy and measures for reducing and adapting to climate change in agriculture. PNDR falls under the conditions of co-financing from the European Agricultural Fund for Rural Development (EAFRD). Within the rural development measures, a minimum of 30% of the total expenditures in Romania must be allocated to be subject to reduction and adaptation activities. The methodology chosen for the proposed analysis takes into account the analysis of the Eurostat and AGRIDATA databases as well as the simulation of the coefficient of beneficiaries of the single payment requests considered eligible. The impact of the results will highlight the image of the effects on food security but also the perception of policies from the perspective of decarbonization of agriculture.

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Sciforum-048390: Responsibly deploying sustainable technologies in Indian Agriculture: A case study of civilian unmanned aerial vehicles (UAVs)

Neha Sehra[1], Rajbeer Singh[2]

[1] Centre for studies in science policy, Jawaharlal Nehru University, New Delhi
[2] Assistant Professor, Centre for Studies in Science Policy, Jawaharlal Nehru University, New Delhi, India

The ongoing COVID-19 pandemic has hit the world alike; the effects can be seen on the Indian agriculture system. However, the recent quarterly GDP estimates show that Indian agriculture is the only sector that registered a positive growth rate of 3.4% in the first quarter of 2020–2021. The agriculture industry is on the rise with the help of information and technological advancements like the internet of things (IoT), precision agriculture, civilian unmanned aerial vehicles (UAVs) for several beneficiary measures, such as optimizing crop yields, crop monitoring, and others. Civilian UAVs or drones can be used in rural areas to spray fertilizers, pesticides, weedicides, etc. The chemical vapours of which might remain suspended in the air, and can pollute surrounding land, water, farm, or livestock. Additionally, the manoeuvrability and operational usage of civilian UAVs depend on the quality of training and skill level of the operator which makes the process accident-prone. Issues like these raise questions on the "responsibility-accountability-sustainability" aspect of the technological process. Therefore, the objective of this paper is to identify or developed the definition of responsibility in the deployment of civilian UAVs in the Indian Agriculture sector. With the help of in-depth interviews and surveys, primary data were collected based on the process of snowballing sampling. The paper addresses questions, such as how the responsibility can be defined in the context of Indian agriculture and what are the key challenges for responsibly deploying civil UAVs in Indian agriculture. Based on a comprehensive review, this paper identifies the advanced prospects of responsible deployment of civilian UAVs in Indian agriculture, which will lead to overall sustainable development.

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Sciforum-048137: The Implications of Increasing the Elderly Population and Declining Young population by 2050 and Onwards on Food Security Issues in Bangladesh

Mohammad Fahim Afsan Chowdhury

[1] Graduated in Sustainable International Development (SID) from Heller School for Social Policy and Management, Brandeis University

In previous decades, food security was a significant challenge for Bangladesh due to its growing population, industrialization, urbanization, and emergence of the effects of climate change. However, thanks to the various policy/program initiatives taken, the country attained self-sufficiency in the production of its primary staple foods , e.g., rice, and considerable development in production of other food crops , e.g., wheat and maize, to meet the increasing needs. In the meantime, Bangladesh has experienced a substantial decline in fertility and mortality due to its improved health care initiatives. As a result, the country is now going through a demographic dividend by utilizing its development sectors to stimulate rapid economic growth. Such a demographic trend may exhibit another consequence in the long term. Various projections show that the number of older people will rise with a decline in working-age people in the future. It is predicted that this complex scenario will be at its peak by 2050 and onwards. The agriculture sector is currently experiencing several constraints. Therefore, a decline in the working force and an increase in the aging population will further complicate food security issues.

The poster aims to answer questions about Bangladesh's demographic trend by 2050 and its implications on food security by analyzing various journal articles, reports, policy documents, cases, conference papers, and books focused on said issues. It considers rice and wheat for the analysis, as these two are the main staple food crops in Bangladesh. It concludes that the declining working population and increasing aging population negatively impact future crop production. It is unlikely that rice and wheat production will meet the projected population's demand by 2050 and onwards based on the present trends. Therefore, several policy initiatives/mitigation measures should be taken into immediate consideration to ensure food security.

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Sciforum-048221: The Potential Influence of Organic Food Consumption and Intention–Behavior Gap on Consumers' Subjective Wellbeing

Diana Ismael

[1] Specialized Partnerships in Sustainable Food Systems and Food Sovereignty, University of Kassel, 37213 Kassel, Germany

This paper applied a self-administered survey to investigate the impact of organic food behavior and the intention–behavior gap in organic food consumption (OIBG) on consumers' subjective wellbeing including physical, emotional, social, and intellectual dimensions. The survey was carried out with 385 consumers. Furthermore, the study conducted a food test to explore the different impacts of organic and conventional food samples on the mental and physical conditions of consumers' wellbeing by applying a psychological questionnaire. The food test took place in a sensory lab with a panel of 63 untrained German consumers. The research findings demonstrated a positive impact of organic food consumption on consumers' subjective wellbeing, while no negative impact of OIBG was perceived. Moreover, during the food test, consumers distinguished no differences between the impact of organic and conventional stimuli on their mental and physical status. Understanding how consumers perceive the impact of organic food consumption on their wellbeing is one important aspect. However, in the interest of narrowing the OIBG, it is more important to understand how consumers perceive the impact of this gap on their daily-life wellbeing.

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Sciforum-048378: The role of probiotics in a circular food system - detoxification capacity

Oana Lelia Pop[1], Ramona Suharoschi[1, 2], Dan Cristian Vodnar[1], Flaviu Alexandru Tabaran[3], Zorita Diaconeasa[1], Amalia Mesaros[4], Elemer Simon[1]

[1] Department of Food Science, University of Agricultural Sciences and Veterinary Medicine, 400372, Cluj-Napoca, Romania
[2] Molecular Nutrition and Proteomics Laboratory, Institute of Life Sciences, University of Agricultural Sciences and Veterinary Medicine, 400372, Cluj-Napoca, Romania
[3] Pathology Department, University of Agriculture Sciences and Veterinary Medicine, 400372 Cluj-Napoca, Romania
[4] Physics and Chemistry Department, C4S Centre, Technical University of Cluj-Napoca, 28 Memorandumului Street, 400114 Cluj-Napoca, Romania

Analyze the recent literature regarding the probiotics, belonging to *Lactobacillus*, *Bifidobacteria*, and *Saccharomyces,* regarding their capacity to protect the human body and the food products from different chemical and biological contaminants. In addition, probiotics consumption and possible risks are also evaluated in a circular food system production and with an overview of human health.
We proposed evaluating the last five years' scientific literature studies on probiotics' capacity to reduce contaminants levels or annihilate their impact on human health. The literature review reveals that, despite the wide variety of food contaminants (physical, chemical, and microbiological), and the narrow likelihood to appraise all the pollutants, probiotics may be safe. In addition to this, all the literature results showed that this pathway is economically feasible and maybe a versatile tool in biodetoxification. Therefore, we evaluated the biodetoxification process in food products and in vivo digestion. This fact raised issues as influences on taste, structure, nutritional value, and probiotics viability. A careful and precise choice of the probiotic strain, applied in certain foods, frequently incriminated by the presence of toxins, and consumed in substantial quantities, may significantly influence food safety.
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Sciforum-033002: Tools for Monitoring Soil and Water Generated for Rural Producers in the Project "Environmental Consequences of Sugar Cane Grain Conversion and Pasture Intensification

Debora Zumkeller Sabonaro[1], Luiz Antonio Martinelli[2], Janaína Braga do Carmo[3]

[1] Post Doctoral Student - Center for Science and Technology for Sustainability - CCTS. Post-Biotechnology and Environmental Monitoring Program, Ufscar Sorocaba, Brazil and Fapesp Fellow. Projects Fapesp Processes (2017/18918-5 and 2015/18790-3)
[2] Nuclear Energy in Agriculture (CENA), University of São Paulo
[3] Center for Science and Technology for Sustainability - CCTS. Post-Biotechnology and Environmental Monitoring Program, Ufscar Sorocaba, Brazil and Fapesp Fellow. Projects Fapesp Processes (2017 / 18918-5 and 2015 / 18790-3)

Conceptual and material innovations in the environmental area are continually being generated at universities and research centers in Brazil and other countries. However, this technology, which is usually developed at a social cost, that is, with public funds, and does not always reach the users of this technology, normally characterizing a gap or lack of approximation between the spheres of technology producer and technology user. Technology transfer has become an effective means for the dissemination of innovation and knowledge. Considering that small rural producers, in most cases, have few resources to meet environmental demands and legislation, mainly for the conservation of natural resources, this study aims to develop technologies developed in the field in order to be transferred to rural producers. The proposal is being developed by the Graduate Program in Biotechnology and Environmental Monitoring, Federal University of São Carlos, Campus Sorocaba, State of São Paulo, Brazil. The project, entitled "Management of technologies generated in projects for the expansion of sugarcane and its environmental effects", has the support of the São Paulo Research Foundation in the Process 2017 / 18918-5. The elaboration of technologies developed for the project "Environmental consequences of the conversion of pasture-sugarcane and intensification of pastures" (2015/18790-3) aims at the transfer of environmental technologies, listing sustainability through the transfer of technologies to producers in rural areas. In this context, technological development is fundamental for the contribution of the conservation of natural resources. The goal is that this generation realizes the problems and thus obtains the tools to look for ways to solve them and prevent possible future degradation.
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Sciforum-048278: Towards a safe and sustainable food crops' production: a case study on potato tubers' contamination with heavy metals and polycyclic aromatic hydrocarbons

Edward Muntean[1, 2], Nicoleta Muntean[3], Marcel Duda[1], Rajmund Michalski[4]

[1] University of Agricultural Sciences and Veterinary Medicine Cluj Napoca, Romania
[2] Research & Development Station for Agriculture, Turda, Romania
[3] Regional Center of Public Health Cluj Napoca - National Institute of Public Health, Romania
[4] Institute of Environmental Engineering - Polish Academy of Science, Zabrze

The contamination of food crops with heavy metals and polycyclic aromatic hydrocarbons (PAHs) is an important quality issue, affecting the safe and sustainable food crop production; more than that, it is the entrance point of these chemicals into the food chain, creating risks for the consumers' health. Most heavy metals and PAHs have a known toxic potential and causes various types of malfunctions in plant, animal and human organisms, outside a certain range of concentrations. Their presence in the environment is the consequence of the fast industrialization, poor management of natural resources, as well as of certain intensive agriculture practices, such as the use of excessive levels of fertilizers; besides, the use of sewage sludge and industrial effluents as a source of nutrients and water for crop production is increasing worldwide. Potato (*Solanum tuberosum L.)* is a nutritious, tasty, and cheap plant product; it is a staple food of many people and holds a large share in the economic balance of many countries. Due to their ability to ability accumulate various chemicals from soil, potato tubers can be easily contaminated with chemicals from environment, which, thus, enter the food chain and may be a risk for consumer's health. In this context, the main purpose of this research was to focus on *Solanum tuberosum's* tubers contamination (Roclas cultivar) with lead, cadmium, copper, zinc, and 15 priority PAHs in the conditions of experimental cultures carried out during three consecutive years in three locations with different pollution patterns: a reference field, a contaminated surface from diffuse sources and a site with historical contamination. PAHs' determinations were performed by high performance liquid chromatography on an Agilent 1100 system with fluorescence detection, while the content of heavy metals was determined by atomic absorption spectrometry using a Shimadzu AA6300 -instrument. The obtained results revealed different patterns of contamination with the target analytes, but they were similar in a higher share of low molecular weight PAHs, mainly naphthalene, fluorene, and acenaphthene. The content of heavy metals was highest in the samples originating from the site with historical contamination, while the content of PAHs was highest in samples from the site contaminated from diffuse sources. Despite the obtained values revealed a low level of the target analytes in the studied matrix, all of them being under the maximum allowed limits established by The European Commission Regulation nr.1881/2006, they proved that the environmental conditions are relevant for the quality of food crops, supporting the need of a careful monitoring of heavy metal and PAHs content in food crops for safe and sustainable food systems.

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Selected talks

Sciforum-048322: A Quantitative Cost-Benefit Analysis of Pesticide Use in German Agriculture

Julia Velte[1], Kirsten Rademacher[1], Amelie Michalke[2], Tobias Gaugler[3]

[1] University of Augsburg
[2] University of Greifswald
[3] Institute of Materials Resource Management, University of Augsburg

To reduce expectable yield losses, farmers use pesticides on a large scale to protect their crops. Whether this use of pesticides in modern agriculture is worthwhile is examined by carrying out a quantitative cost-benefit analysis, using Germany as an example.
For this calculation, direct, as well as indirect, pesticide costs for 29 main crops were assessed. Direct costs were considered for different spraying intensities. For indirect costs, hours of work, the use of machinery, and field-to farm distances were taken into account. The total costs of pesticide use on farm level add up to EUR 1.8 billion annually.
The additional saved yield required to cover these pesticide application costs translate to 8% for low, 10% for medium, and 14% for high spraying intensity. To explore the actual possible yield protection through pesticide use, results from studies primarily related to grains were drawn. After a comprehensive literature review, a sensitivity analysis was conducted. Based on this analysis, a yield protection of 21.5 dt/ha, which correspond to 29% of the current average yield per hectare of wheat, is enabled, which justifies a high spraying intensity. Putting this share into relation with producer prices and all crops considered results in benefits of EUR 3.6 billion for German agriculture.
Comparing these monetary benefits and the total costs leads to an annual net benefit of EUR 1.8 billion resulting from pesticide application in German agriculture, meaning the economic added value is twice the related costs.
This result contributes to a data-based debate on the adequate use of pesticides.
Although it has been shown that the use of pesticides is economically advantageous at the level of farmers, further research must also include negative environmental and health impacts caused by the use of pesticides. First results indicate that these negative externalities exceed the economic added value by far.

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Sciforum-048263: Sustainable Agropolis: Integrated strategic management instrument in the face of global challenges in arid territories of Mexico

Ph D Héctor Tecumshé Mojica-Zárate

[1] División de Ciencias Biológicas de la Universidad de la Sierra, Moctezuma, Sonora, México. C.P. 84560

Ecosystems ranging from dry to desert in Mexico comprise about 83% of the country's surface. In some of the most arid and water-deficient areas, agro-productive activities are carried out. These agro-productive territories are made up of nodes that contribute to the economy and sustain security and food sovereignty, but at the same time are at risk due to the fragility of their productive mechanisms and elements of their integrity. Based on the application of an integrated strategic management method, the trend of sustainable operation of agro-productive activities in an arid Mexican territory is analyzed from a complex and systemic perspective. The complex interweaving is configured from indicators related to health, natural resources, decent work, companies, and organization for production, climate, and type of ecosystem, interaction with the city, and the alliance between different actors. Which are analyzed from the link level (LL), resilience capacity (REC) and risk control (RIC). The complex and adaptive concept is the Sustainable Agropolis, which for the case is defined in the arid territory of Moctezuma, Sonora, Mexico to face climatic and health emergencies in this arid ecosystem. According to the total of components identified for each of the agropolitan nodes, they are determined 73% by LL, 82% by REC, and 94% by RIC. Water resources (0.98), labor force (0.92), pollinating fauna (0.97), and soil fertility (0.96) stand out as determining inputs. Water appears as a resource with low resilience capacity (0.22) and with the least control of risk (0.17). The response capacity to contain the onslaught of climate and health emergencies depends on the strength of the links between the agropolitan nodes that make up this complex network and systematic, measured from the link, the resilience and the risk of the elements that make up each node. This agropolis articulates factors and elements that give fluidity and operability for the exercise of sustainable development in this arid zone of Mexico

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Sciforum-037460: Sustainable approaches for reintegration of cereal waste into valuable products

Farcas C Anca, Sonia Ancuta Socaci, Maria Tofana, Liana Claudia Salanta

[1] University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca

One of the most trending topics debated by the scientific community lately is developing and optimising sustainable strategies for the reintegration of vegetal and animal waste into valuable products, minimisation of energy consumption and environmental protection. The idea of converting the cereal by-products into functional fractions of ingredients represents a research area with great potential and opportunities due to the high content of fibres, proteins, amino acids, lipids, antioxidants, minerals, and other compounds that remain unexploited in the main process.
This research offers a complex overview of brewing industry by-products as sources of bioactive compounds, also discussing several potential strategies for their conversion into valuable products with multidisciplinary applications (functional fractions, biofuels, food, cosmetics, and pharmaceutical components), current challenges, extraction techniques, and future research opportunities in the field. In general, current research focuses on developing and optimising integrated extraction protocols to maximise the recovery efficiency of functional fractions, reduce solvent and energy consumption by applying green and environmentally friendly technologies, and diversify their applicability in various fields. In this context, according to the latest findings, the exploitation of brewing and other cereal by-products for the recovery of valuable functional compounds can be considered of high interest.
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Abstracts

Session TM. Transport and Mobility

Posters' abstracts

Sciforum-048359: A Trend Analysis in Research About the 2030 Agenda, Ods and Mobility in Recent Times

Italo Schelive Correia[1], Luara de Oliveira Schelive[2], Matheus Franco Carvalho[3]

[1] University of Tocantins
[2] Federal University of Tocantins
[3] University of Debrecen

Mobility is seen as one of the main drivers of the sustainable future of the 2030 Agenda. Directly linked to the SDGs "3 - Good Health and Well Being", "11 – Sustainable Cities and Communities", and "13 - Climate Action", and indirectly to others, the theme engages solutions aiming enhancement for people and environmental issues. For better understanding of how the dynamics of publications on this subject function, this work seeks to present and discuss the main areas, documents, authors, keywords, and countries that provided research on Agenda 2030, SDGs and Mobility. Thus, this bibliometric research was developed using data collected in the SCOPUS database. For this purpose, the terms "2030 Agenda", "Sustainable Development Goals", "SDGs", and "Mobility" were searched through the equation "2030 AGENDA" OR ("SUSTAINABLE DEVELOPMENT GOALS" OR "SDGS") AND ("MOBILITY") in the titles, abstracts, and keywords of the articles indexed in the SCOPUS platform, resulting in 174 works found, which after a filter for publications by 2019, that were scientific articles, published in "journals" and on the stage "completed", 43 articles were selected, divided into 14 areas of knowledge. From these 43 selected articles, the three main areas were: 26 articles in the area of Social Sciences, 17 in Environmental Science and 10 in Energy. The Social Sciences area leads the research related to the search terms, with 9 more scientific articles than the second area, Environmental Science, and 16 more than the third, Energy. The authors attribute first place to "Social Sciences" due to the need to discuss the formulation of public policies on this subject, however, further work is needed to better understand these results. It is also necessary to reflect that an article can be registered in more than one area, since the works appear 73 times in 14 areas, in a universe of 43 articles.

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Sciforum-044096: The PMUSA of Cartagena city: a new approach on the integrated vision of urban planning and sustainable mobility based on the city of 15 minutes

Salvador Garcia-Ayllon

[1] Technical University of Cartagena, Associate professor

Urban planning and sustainable mobility planning are two increasingly convergent disciplines in the field of sustainability research. The creation of cities that are more resilient and aware of climate change requires an integrated and multidisciplinary vision in various areas that goes beyond traditional technical planning. Rather, it is about introducing new planning tools that are capable of modifying the behavior patterns of citizens beyond their simple condition of transport users. Cartagena's new sustainable and accessible mobility plan proposes a new approach based on the 15-minute city that has been implemented in various European cities, introducing new methodologies for the analysis and evaluation of urban behavior patterns. From various GIS tools, various indicators of environmental and urban quality of the city are implemented that allow both a past accurate diagnosis in multidisciplinary approaches, as well as the implementation of tactical or structural solutions that can later be measured and evaluated through monitoring indicators. These indicators are integrated into a framework that allows a multivariable multidisciplinary evaluation as a diagnostic, analysis, and solution proposal tool to achieve more effective sustainable mobility.

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Selected talks

Sciforum-048272: Anticipating Sustainability of Smart Energy Network for Electric Vehicles in Delhi: Responsible Innovation Approach

Shilpa Mishra

[1] Center For Studies in Science Policy ,Jawaharlal Nehru University

Sustainable mobility is one of the goals of sustainable development. Achieving such mobility is the primary focus of every country in the world. However, in the case of developing country India, reaching this target seems impossible at present. But emerging alternatives like e-vehicles are being seen as a hope for this aim. Availability and sustainability of charging stations determine the success of India's e-mobility. Current e-vehicle charging stations have problems, such as unplanned installation, non-connectivity to renewable energy sources, restricted charging methods, ease of use, and a separate installation of charging stations and swapping stations. In this context, this paper proposes a smart energy network (consisting of charging stations and swapping stations connected to the renewable grids and smartphones of users) for electric vehicles in the City of Delhi under a responsible innovation framework. The RI approach has anticipated certain values (universal and cultural-specific) for the proposed technology. Through these values, the research work has tried to anticipate the sustainability of the chosen technology. Data collection methods are: online-based questionnaire survey, field survey, non-participant observation, and secondary literature review. The paper's main conclusion is that the proposed technology achieves environmental, social and economic sustainability if it has certain values, such as ecological cleanliness, independence, safety, security, a universal utility, efficiency, reliability, and technical literacy. Finally, the research work found that the RI framework proves to be a suitable framework to estimate the sustainability of future technologies by embedding certain values.

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Sciforum-048480: Integrating Social Media Data for Computer Vision-based Applications for Autonomous Driving and a Safe, Energy-Efficient Future

Thomas Y Chen

[1] The Academy for Mathematics, Science, and Engineering

The rise of autonomous vehicles yields many opportunities in terms of transportation safety and efficiency. Many autonomous vehicles are now driven by computer vision-based technology. Computer vision, the study of how computers gain high-level insights from imagery and video, has largely been conducted using deep learning (multi-layered machine learning) techniques in the last decade. In this introductory work, we discuss the use of social media data for the training of convolutional neural networks for scene and object identification, with the goal of implementing them in self-driving cars, such that navigation mechanisms will allow for the avoidance of obstacles and the saving of lives in difficult situations. Social media platforms have become increasingly popular in recent years, as they are utilized by people around the world to post images and text during times of relaxation, as well as times of crisis. Social media data (the user-created content itself) is analyzed using machine learning in two primary ways: natural language processing (NLP) and computer vision. Computer vision-enhanced approaches can be useful in a variety of fields, from humanitarian assistance and natural disaster response, to wildlife conservation. In regards to autonomous driving, we first acknowledge that social media networks, such as Twitter and Instagram, contain various sets of imagery depicting situations on the road from the perspectives of individuals in vehicles. Collecting this data through web scraping and subsequently crowdsourcing labels for object segmentation is conducted through platforms, such as Amazon Mechanical Turk. Further, we train a convolutional neural network of the AlexNet architecture on these data. Finally, we compare the results to other works in the literature utilizing other sources of data for deep neural network training in this scope. We seek to determine whether transfer learning from social media-based vehicle-level scene data are effective when deployed.

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Sciforum-046298: Optimisation of sustainable in-plant supply in a cyber-physical production system

Tamás Bányai

[1] University of Miskolc

Industry 4.0 technologies make it possible to improve the performance of processes in production and services. In production systems based on new production paradigms, like matrix production, state-of-the-art technologies are becoming increasingly important, not only to improve the quality of processes and products but also to meet increasingly diversified customer needs in a cost-effective way while ensuring a sustainable production system with low environmental impact. Within the frame of this research work, the author examined the possibilities offered by the solutions and tools that came to the fore in connection with the Fourth Industrial Revolution for the optimization of material handling processes within matrix production, with special regard to digital twin, intelligent tools, and gentelligent products. An integrated metaheuristic approach is presented to optimise the in-plant supply processes from an energy efficiency and emission point of view, based on black-hole- and flower-pollination-based optimisation.

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Abstracts

Session O. Others

Posters' abstracts

Sciforum-039744: From the effects of electromagnetic radiation emitted by GSM antennas on plantations and the role of fertilizers

Adela Sorinela SAFTA[1], Popescu Lavinia[2, 3]

[1] Bucharest University of Economic Studies, Bucharest, Doctoral of Economic School
[2] The Bucharest University of Economic Studies
[3] University of Bucharest Faculty of Law

This work approaches in a unique way the pressure exerted by the global ascent of the development of global mobile system communications in the entire area of the territory from arable lands, to meadows and plains on mountains and in the whole community. If in the community these GSM antennas can affect through electromagnetic radiation during the study we will try to draw some direct effects that can lead to environmental aggression whether we refer to wheat plantations, rapeseed, sunflower, the environments in which these antennas are mounted. Mainly we will reflect if the optimal allowed distance can influence the growth of plantations, the type of fertilizers cause effects that interfere with the level of electromagnetic radiation produced by the antennas, the distance and adaptation solutions with proposals for the future. The opening of advanced technologies with new satellite rounding possibilities is expensive so that currently the density of GSM antennas and high-power 3G/4G data-internet and in the future 5G is the technical solution of operators, the study analyzes experimentally whether electromagnetic waves can affect to what extent do these radiation affect plants, soil, and whether fertilizers produce expected effects.

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Sciforum-046047: Re-engineering the world's largest anti-poverty Scheme, MGNREGS: ICT4SDG1

Harshal Kate

[1] Indian Institute of Technology (IIT) Delhi

Addressing poverty remains a significant global challenge, with an estimated 10% of the world population (734 million) living on less than 1.90 USD/day (2015). In total, 21.2% of India lives below the poverty line as of 2011, a majority (70%) are dispersed in rural areas. Mahatma Gandhi national rural employment guarantee scheme (MGNREGS) is a crucial effort by the ministry of rural development (MoRD), Govt. of India, to accomplish SDG 1 by 2030. If efficiently implemented, the scheme can enhance the livelihood security of hundreds of million rural adults by guaranteeing wage employment (with caveats). However, there is a significant gap between the policy document and the field implementation of the scheme.
This study draws on exploratory qualitative work grounded on baseline review (as-Is mapping) through a cross-stakeholder analysis approach. It examines the scheme dynamics, identifies gaps across administrative tiers, and recognises factors that contribute to these gaps. Furthermore, the constructed systemic framework recommends ICT based pathways and determinants to address the identified gaps. This allows us to establish an operational case for process re-engineering rooted in on-ground experience, responding to practical realities.

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Sciforum-048175: Stakeholders' Engagement in Nature-Based Solutions: Insights from Romania

Cristina Gabriela Mitincu, Ioan Cristian Iojă, Andreea Niță, Constantina Alina Hossu

[1] University of Bucharest, Faculty of Geography, Center for Environmental Research and Impact Studies, Romania

Environmental action plans are intended to provide the main forms of guidance for environmental protection, playing a vital role in reconciling environmental quality with social and economic development. The success of their implementation relies on collaboration between the actors involved. Therefore, our study aims to identify the types of stakeholders responsible for the implementation of actions proposed to manage environmental problems, with a core focus on the Local Environmental Action Plans (LEAPs), and the extent of their collaboration. A sample of seven LEAPs from Romania was selected to identify the stakeholders responsible for the implementation of LEAP actions. The stakeholders were classified by type into two categories as follows: (a) public officials (e.g., of national, regional, county, and local structures) and (a) the general public (e.g., academia, private companies, non-governmental organizations, and citizens). They were also classified according to their role in seven categories: (a) innovators, (b) change agents, (c) transformers, (d) mainstreamers, (e) laggards, (f) reactionaries, and (g) controllers. A network analysis approach was employed in order to identify the most involved and influential stakeholders, as well as the relationships between them. Our results show that the public administrations at county and local levels, along with the controllers, are the most involved in the environmental planning process. Furthermore, the implication of the citizens and academia was low, as was that of innovators and transformers. In conclusion, our study tries to better understand the collaboration and coordination of different sectors in order to offer recommendations for an efficient implementation of environmental planning.

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Sciforum-048475: Animal Production in Urban Backyards: Climate Change and Food Safety

Ramon Soriano, Ladfislao Arias

[1] Socio-environmental Resources and Sustainability Laboratory, Universidad Autónoma Metropolitana

Backyard animal production (poultry, rabbits, and pigs) is widespread in developing and middle-developed countries around the world, and the metropolitan area of Mexico City is no exception. In this sense, it is an activity that should be reconsidered as part of development programs in urban areas aimed at alleviating hunger and combating global warming and climate change. Urban backyard animal production is a production system that consumes city waste and reduces its carbon footprint. Urban backyard animal production provides jobs and contributes to food security and, finally, the distribution of its products in the city comes directly to the consumer, with a low carbon footprint derived from transportation. In the city of Mexico and its Metropolitan conurbation, the by-products of the juice industry, bread baking, tortilla, local market places, and others are used to feed backyard animals with success. Afterwards, produce is consumed by producers or commercialised to neighbours or in local markets. These are also used for celebration of al type. These residues following their natural course would become sources of greenhouse gases. When used in the urban backyard, the carbon from these is fixed in the products and thus prevents them from escaping into the atmosphere. The composition of backyards in the Metropolitan area of Mexico City (ZMCM) is explored in terms of the species present and number of animals, as well as making a first attempt to explain their social and productive dynamics in terms of the resources used and its impact on the carbon footprint and its sustainability.

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Sciforum-031151: Assessment of Radionuclide activity of Building Materials with Unconventional Secondary Additives

Eva Singovszka, Adriana Estokova, Natalia Junakova, Jozef Junak

[1] Technical University of Kosice, Faculty of Civil Engineering

People spend up to 90% of their time in indoor environments, so the basic requirement in the construction of buildings must be a thorough analysis of the building materials used in relation to their potential health risks. At present, when the trend is to reduce greenhouse gas emissions and to replace cement in concrete by a number of secondary or waste materials, this requirement is particularly relevant. Knowing the radioactivity of building materials is essential as one of the potential risks to human health.

The paper deals with the study of natural radioactivity of cement composites containing special secondary material as cement replacement: natural lake sediment taken from the selected reservoir. Three types of cement composites with the same portion of cement replacement (40 wt. %) were used for the research of radioactivity of building materials. Cement was replaced by untreated fine-grained lake sediment, milled lake sediment, and burned lake sediment. The modification of the lake sediment was necessary to increase the pozzolanic activity of the sediments and thus to improve the mechanical parameters of the composites. The composite that did not replace cement with sediment was analyzed as a reference.

The paper presents the results of gamma radiation monitoring by measuring the mass activities of the most important natural radionuclides ^{226}Ra, ^{232}Th, and ^{40}K, which are commonly found in building materials, in all individual materials and final composites as well. Based on the measured activities, two selected radiological indicators, gamma index (I_γ) and dose rates (D), were calculated. The calculated radionuclides´ gamma index in analyzed cement composites was several times higher for sediment composites (I_γ = 0.7 to 0.8) compared to non-sediment composites (I_γ = 0.15). This was due to the high mass activity of radionuclides in the sediment sample and was also reflected in a high gamma index (I = 1.242). However, none of the cement composite samples exceeded the limit value of I = 1 for masonry materials. The absorbed dose rate in indoor air, calculated for the structures in a model room, ranged from 161.9 to 294.1 nGy/h, which is up to twice as high as the world population-weighted average indoor absorbed gamma dose rate (84 nGy / h). Findings revealed that although the gamma indexes of sediment-based cement composites do not exceed permitted limits, the use of such materials for the construction of residential buildings may be potentially dangerous.

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Sciforum-048440: Bibliometric analysis of sustainable development in the context of the COVID-19 pandemic

Lacramioara Alina Dracea, Daniela Maracine

[1] BUCHAREST UNIVERSITY OF ECONOMIC STUDIES

Sustainable development is a holistic concept that combines social, economic, and natural aspects, being involved in two great problems of humanity: the ability to create and the ability to destroy.
This concept represents the future path of humanity, able to ensure the protection of the environment and a real opportunity for future generations.
The evolution of sustainable development faces multiple internal and external challenges, generated by the phenomena taking place in society, the largest being currently the expansion of the COVID-19 pandemic, which has affected all aspects, and areas of life in the last year. In this context, defining strategies and actions that resist the economic and social crisis triggered by the pandemic is a challenge.
This paper shows interest in this subject in the literature and comes to carry out a quantitative analysis using the VOSviewer software of the specialized works of the Web of Science platform containing in the composition of the title, abstract, or keywords the required terms from the two fields.
The research methodology involves the development of a bibliometric analysis that allows determining the areas and interest given to this subject using a specialized platform, the one mentioned above, together with special software created by its developer to create density maps and illustrate the bibliographic links that are established between them. The analysis has complexity and integrity, the quantitative analysis is presented at several levels of exposure, such as analysis of works at the national level, analysis of works at author level, or analysis of works at field level. Before the analysis, hypotheses were set on the quantitative evolution of the works of interest, which were tested and verified through this paper.
The query resulted in the display of a large number of existing scientific documents in the database containing the words 'sustainable development' and 'COVID-19' in the title, summary, or keywords, including publications, regardless of location or date of publication.

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Sciforum-047907: Bridging Social and Environmental Sustainability: Instigating Solidarity through An Eco-friendly Public Art

Eurydice Rayanna Lo Chan

[1] Polytechnic University of the Philippines

Although there is a plethora of what sustainability can be, approaches tend to address its dimensions separately. The concept of sustainable development originally included a clear social mandate, for two decades the human dimension has been neglected. However, it is clear that action in one area will affect outcomes in others, and that development must balance social, economic, and environmental sustainability. This paper narrates a public art installation project in which the community is the resource. The materials were selected from their natural environment and industries. This acquainted the members to the diverse capabilities that actually exist within them, since these materials relate to their skill sets. With these materials, diverse members of the community were able to participate – bamboo craftsmen, school children, and people with disabilities. The inclusive participation resulted in participants showing concern for another, such as providing assistance to the members with disabilities, and incorporating upcycled materials to reduce community waste. It also led to the inauguration of events for the community which were proposed by the participants during the course of the project. The project's concept intuitively geared the members towards aiding the community. Giving the community members the freedom to dominate the project initiated their realizations that collectively their contributions can empower the community. This refers to the idea of solidarity, that people have obligations to each other and in part to a sense of shared identity and commitment. Hence, this concludes that the approach to the project is a strategy that bridges ecological integrity and social well-being, the elements of a sustainable community.

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Sciforum-048456: Built Heritage Restoration for Sustainable Development: A Study on Benefits of Pak-Italian Joint Collaboration for Restoration of The Historic City of Saints, Multan

Sunera Imtiaz[1], SYYED ADNAN RAHEEL SHAH[2], Ghulam Muhammad[3], Hasan Ali Raza[4], Muhammad Shahzad[4]

[1] Department of Building and Architectural Engineering, Bahauddin Zakariya University, Multan
[2] PIET Multan and Hasselt University
[3] Department of Archaeology, Govt. Of Punjab, Multan
[4] Walled City of Multan Project, Govt. Of Punjab, Multan

Classical architecture and restoration of historic structure are back bone of any culture and civilization. Conservation of historical buildings provides a living life to the human beings and connect them with the glorious past leading to sustainable development. Multan, one of the oldest cities of world contains a series of historical buildings within its old claimed wall, that is why known as walled city because of its ancient fort like design. Within that wall, structures are glittering with classical architecture with a combination of priceless artwork. History and grace are reflected by the style and craftsman ship. It is necessary to preserve those assets for future generation to maintain the hearty connection between generations. Italian experts from Politecnico di Milano arrived for help and contributed to restoration of the walled city. In this study one of the components of the project of walled city, Musafir Khana, a part Musa Pak Shaheed Complex, was analysed for its deterioration in detail and was restored as per structural and architectural perspective. This work was done by the Pakistan-Italy collaboration to save valuable heritage. The aim of this paper is to assess the benefits of the joint Pak-Italian project for restoration of historical structure within walled city considering future sustainable developments as part of Sustainable Development Goals (SDGs).

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Sciforum-048288: Can Mining Provide a Sustainable Source of Livelihood to Local Communities? Evidences from Odisha, India

Minati Sahoo

[1] Central University of Odisha, India

Odisha has long been recognised as a state well-endowed in natural mineral resources. The mining sector, therefore, is one of the most important sectors in Odisha. However, can it be a sustainable source of livelihood to the local community? Hence, an attempt has been made in the present paper to examine mining as a sustainable source of livelihood. The study has adopted a sustainable livelihood framework to explore the impact of mining on five types of capital (financial, physical, natural, human, and social) that are necessitates to achieve a sustainable livelihood. The Keonjhar district, the most mined district and the centre of iron ore production of Odisha, has been taken as the study area. With and without approach has been used to attain the objective. Mathematical and statistical techniques, such as t-test, chi-square test, and regression analysis, have been used in the present study to analyse primary data. It is found that mining has failed to provide a sustainable source of livelihood to the local community even though it helps in the augmentation of their financial and physical capital. This is due to its negative impact on social, natural, and human capital. However, this does not mean that mining should be stopped. Rather it should be carried out in such a way that would cause not only least damage to environment, but also contributes social and economic development of the region where it is undertaken. Therefore, ensuring that the adverse impacts are minimised and the benefits from mining to the local community are optimised, it becomes critical for mining to be being carried out in a sustainable manner.

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Sciforum-048127: Causes and Complications of Cesarean Section Delivery among Women in Cox's Bazar, Bangladesh

Zaziratul Zannat[1], Dr. Nazmul Alam[2], Dr. Mohammad Manir Hossain Mollah[3]

[1] Dept. of Public Health, BRAC James P. Grant School of Public Health, Dhaka, Bangladesh
[2] Dept. of Public Health, Asian University for Women, Chittagong, Bangladesh.
[3] Dept. of Bioinformatics and Public Health, Asian University for Women, Chittagong, Bangladesh.

Unnecessary cesarean section (CS) delivery is a major problem in Bangladesh, and it is draining resources from both supply and demand sides. Many women choose cesarean delivery because of indicated causes in pregnancy, fear of unbearable labor pain, thinking about the safety of the child, etc., which leads to many unwanted complications. The aim of this research was to investigate the causes and preferences of cesarean delivery and to characterize the outcomes after cesarean section delivery. This cross-sectional study was conducted by using a semi-structured questionnaire among women who delivered in selected hospitals in Cox's Bazaar, Bangladesh. The total sample size number was 273 women with a mean age of 26.72 years. In this study, the key reasons found for doing CS delivery were mother's age, occupation, higher education, previous cesarean, doctor's recommendation, fear of normal delivery, and concern about baby's health. Results showed that 48.7% of women faced complications and 50.3% of participants did not face any complications after CS delivery. The most frequent complications were pus, 22%, and obesity, 13.9%, among the participants, and breakdown of membrane 28.2%, excess bleeding 19.4%, extreme pain 19%, and prolonged labor 18.3%, were found as the main causes indicated by the doctors for cesarean delivery. The prevalence of CS was found to be much higher than the anticipation of WHO. The causes of cesarean delivery led to complications with various factors that affect women's health directly and indirectly. It is necessary to reduce the rate by making the mothers aware of the risks of cesarean delivery and providing training workshops as well to overcome the fear of normal delivery.

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Sciforum-031412: Environmental Justice and sustainability through Access to non-judicial grievance mechanism

Adetokunbo Alase

[1] PhD Candidate, Western Sydney University, Australia , Lecturer, Lead City University, Ibadan(On study leave)

Economic liberalism, which operates mostly through bilateral investment treaties, was encouraged by states for developmental purposes with restricted government interference. There was technology transfer and companies began to operate with the exclusive aim of making profit for sustenance. However, there was little or no initiative to protect the natural environment and human rights from abuse, or to prevent negative externalities. The 2011 United Nations Environment Programme (UNEP) Report on Nigeria Ogoni land found that the environmental damage done on swamp and mangroves, livestock, fisheries , public health, water quality, and land based vegetation has rendered the region unfit for living, hence the need for environmental accountability, rehabilitation, and restoration.
However, business has not learned how to handle these changes, nor does does it recognise the magnitude of its responsibilities for the future of civilisation (Pittie 2002:50). This paper notes several attempts made through a corporate social responsibility framework that stands as a road-map for businesses to give back to the environment. This notion, I believe, has been proliferated and creates gaps in the environmental sustainability discourse; in order to remedy these defects, an informal governance mechanism—the non-judicial grievance mechanism—has been proffered.
The Earth Summit 1992 (UNCED) set the pace on environmental and sustainable development. More than twenty years later, consultations are still ongoing for effective remedies for breaches caused by businesses as complementary to compensation. Having thought and developed the complexity facing the human race (Anthropocene concept), the UNHRC adopted the John Ruggie (protect, respect, and remedy) Guidelines 2011. This study posits a blueprint for action on sustainable development, in addition to aid with the most comprehensive, participatory, and effective framework on 'accountability' strategy regarding the environment and human rights. This research seeks to evaluate sustainability through non-state based, operational, non-judicial grievance mechanism for the remedy of a business-related environmental abuse—restorative justice option.
This paper will employ a doctrinal and an empirical approach to investigate the mainstreaming of restorative elements to environmental disputes. It further seeks to contribute to knowledge and give credence to Principle 16 of the Sustainable Development Goals (SDG)

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Sciforum-030672: Evaluation Model for Sustainable Development of Settlement System

Alena Harbiankova[1], Elena Shcherbina[2]

[1] Belarusian-Russian University
[2] Moscow State University of Civil Engineering (National Research University)

Sustainable development of settlement system is of greatest relevance in political and socio-economic stability for many European countries. At the same time, the development effectiveness of rural settlement system involves the solution of a number of matters in sustainable development namely social welfare and environmental balance, economy and industry development, improving the pipeline and utility infrastructure, improving the efficiency of the decision-making process. Sustainable development of rural settlement system is one of the key objectives in land use planning in current socio-economic settings. Therefore, the introduction of new tools for assessing and managing the settlement system development is particularly true for Belarus, as the most urbanized country in the European region. The research aim was to develop and approve the model for evaluating the development of settlement system. The research methods were based on the complex and interdisciplinary approaches namely the system-element approach, the comparative analysis, spatial, and mathematical modeling, factor analysis, the cartographic analysis.
The model was approved by practical consideration for the evaluating the development of 14 rural settlements as the analogue objects at the local planning level. At the first stage, the basic development indicators were established and a set of the diagnostic variables was prepared in accordance with the previously established criteria. At the second stage, the development of rural settlements was evaluated by using both the entropy method and the hierarchy method. The model based on the entropy method includes an evaluation of the second level indicators and definition of an aggregate index. The model based on the hierarchy method includes both the determination for the significance and the standardization of the development indicators values. The results of evaluation development by applying the hierarchy method were highly resilient to the results involving the entropy method, so we suggested that the model is adequate. Accordingly, the obtained results demonstrate the validity and efficacy of the suggested model, which allows on the one hand to solve the problems of the system multicriteriality, stakeholder participation and scenario analysis, on the other hand, to make the assessment less-subjective.
The proposed model makes it possible to determine both comprehensive indicator and certain components of settlement system—economic, environmental, administrative, anthropogenic, and social. The practical relevance of the research is in potential of using the model as a significant tool in land use planning: the obtaining both quantitative and qualitative evaluation for through development scenarios, which are necessary at various stages of land use planning. In addition, the key feature of the model is its multifunctionality, which allows to evaluate the system sustainability at all level, to set the priority areas and to develop specific measures for ensuring the sustainability of rural settlement system and its elements.

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Sciforum-047610: I Want to Buy a Ceramic Pot: Pottery Making in the Time of a Pandemic in the Island of Bohol, Central Visayas, Philippines

Rhayan Gatbonton Melendres

[1] University of the Philippines

Pottery making is one of the indigenous craft specializations in the Philippines. It is a cultural identity marker of a particular group or society and gives potters financial incentives. It is also environmentally friendly and sustainable to produce. However, even since before the COVID-19 pandemic, ceramic production has been a dying form of material culture creation. Filipinos prefer to use plastic and metal utilitarian and decorative vessels in their daily lives. Added to this is the aging of the potter population and the refusal of younger generations to continue their traditional knowledge and craftsmanship.

One of the islands in the Philippines with pottery traditions is Bohol in Central Visayas. Presently, four villages on this island continue to make traditional pottery. These are the villages of Bagacay in Talibon, Binogawan in Calape, Canduao Occidental in Valencia, and East Poblacion in Alburquerque.

I collected the data for this research pre-pandemic in 2017 and 2018 and at the height of the pandemic in March to May 2021 through survey interviews, participant observation, focus group discussion, and photo and video documentation. I will present the impact of the COVID-19 pandemic on ceramic production and distribution in Bohol. Specifically, I will show the effects of the pandemic on potters' census, the financial reward for the potters, the survival and continuity of the tradition, the proliferation of ceramic use among consumers, and the positive influence of pottery making on the environment. With these results, I will propose ways to stakeholders like the local government, the consumers, and the potters themselves to make pottery making in Bohol financially rewarding, sustainable, and environmentally friendly.

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Sciforum-048355: Landscape Analysis in an Area Under Desertification Process in the Brazilian Semi-Arid

Bruno Fonseca Silva[1], Rodrigo Zimmerle dos Santos Rodrigues[2], Andrezza Karla de Oliveira Silva[2], Plínio Barbosa Camargo[3]

[1] Applied Ecology Graduate Program (Interunits), Universidade de São Paulo, Av. Centenário, 303, CEP 13.400-970, Piracicaba, São Paulo, Brasil
[2] Post-Graduate Program in Geography, Department of Geographical Sciences, Universidade Federal de Pernambuco, Av. Prof. Moraes Rego, 1235, CEP 50.670-901, Recife, Pernambuco, Brazil
[3] Center of Nuclear Energy in Agriculture, Universidade de São Paulo, Av. Centenário, 303, CEP 13.400-970, Piracicaba, São Paulo, Brasil

The desertification process is one of the main problems affecting the Northeast region of Brazil. The environmental impact caused is mainly reflected in changes in the landscape structure. The present work aims to evaluate the landscape structure in an area under desertification process in the Brazilian semi-arid region. The study was carried out on the island of Asunción, Cabrobó, Pernambuco, Northeast, Brazil. The mosaics of Landsat images (1985–2019) were obtained on the MapBiomas-Brazil project platform, being performed the classification and obtaining the respective landscape metrics with the use of QGIS software. The results of land use and cover change would consist of areas of Hyperxerophilic Caatinga Formation (62. 2%), Pasture (12. 5%), Grasses and Herbaceous Vegetation (9. 3%), Mosaic of Agriculture and Pasture (8.3%), River and Lake (3.2%), Perennial Crops (3.2%), Mosaic of Crops (0.9%), Urban Areas (0.3%), and Hyperxerophic Caatinga Formation (0.1%). Correlation analysis showed that Hyperxerophic Caatinga Formation is mainly affected by the expansion of Perennial Crops and Mosaic of Crops, however, the respective classes do not affect Hyperxerophic Caatinga Formation. The results of this study are important for monitoring and ecological conservation of areas undergoing desertification.

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Sciforum-031377: Leave No-One Behind: Access and Equity as Important Factors in Managing the Water–Energy–Food Nexus in (North and Sub-Saharan) Africa

Faten ATTIG BAHAR[1, 2], Marja Spierenburg[2, 3]

[1] Chair of Wind Energy Technology. Faculty of Mechanical Engineering and Marine Technology. The University of Rostock. Germany,
[2] SC Nexus Knowledge-Action Network, Future Earth
[3] Chair Anthropology of Sustainability and Livelihoods, Dpt. of Cultural Anthropology and Development Sociology, Leiden University , the Netherlands;

Africa is the second-largest continent in the world and covers approximately 20 percent of the Earth's land surface, contributing to about 16.64 percent (Worldometers, 2019) of the total world population. The continent is highly diverse, in terms of history, culture, and socio-cultural and political contexts, as well as natural resources and biodiversity. However, development in Africa is unequally spread, and the high levels of economic growth that a number of African countries witnessed until recently have not translated into a general increase in well-being.
In 2013—prior to the adoption of the Sustainable Development Goals in 2015—the African Union put forward its 2063 Agenda (AU, 2013), which is guided by a vision of "an integrated, prosperous and peaceful Africa, driven by its own citizens and representing a dynamic force in the international arena." The 2063 Agenda is an all-compassing strategy to optimize the use of Africa's resources for the benefit of all Africans through inclusive growth and sustainable development. In this presentation, we argue that this requires connecting the different goals formulated in this vision, which also applies to the SDGs. We focus specifically on the water–food–energy nexus, which connects, among others, SDGs 2, 6, 7, 14, and 15. In line with the Research and Engagement Plan of the Nexus Knowledge–Action Network, we argue that these, in turn, need to be connected with SDG 10.
While the WEF nexus is increasingly recognized as important, much of the research and policy-making focuses on managing the supply side. Based on a number of case studies in North and sub-Saharan Africa, we will present ways of addressing issues of inequality in access and benefits in WEF nexus research.

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Sciforum-031913: Rationalized Poverty Targeting to Sustain Delivery of Basic Human Needs of the Income Poor

Dina Cartagena Magnaye

[1] Associate Professor and Director of Research and Publication at the University of the Philippines School of Urban and Regional Planning
[2] Affiliate Assistant Professor and Program Chair of Diploma in Land Use Planning at University of the Philippines Open University

The study covers an analysis of the proximate determinants of income poverty to identify the basic human needs of the income poor; formulate and prioritize local poverty reduction initiatives; and identify mechanisms to allocate local financial resources in implementing local economic development programs and projects. The community-based monitoring system (CBMS) household data of the Province of Tarlac in the Central Luzon Region of the Philippines established the core local poverty indicators that provided the foundation of examining income poverty at the local level based on human welfare dimensions, such as health and nutrition, housing, water and sanitation, and basic education.
The study uses the logistic regression (Logit Model) to determine the factors that affect the likelihood of being income poor given a total sample size of 110,144 households that are clustered according to the hierarchy of settlements (Small City, Large Town, Medium Town, and Small Town) of the selected study sites. The results indicated that the probability of being income poor is influenced by the characteristics of the settlements and the membership of households. These factors are utilized in formulating a local economic development plan that aims to uplift the economic condition of the income poor at the local level.
In a political lens, the development thrusts and agenda of the local leaders and their council still remain as the primary basis of determining the local economic development programs and projects that will be funded for implementation in a locality. Nevertheless, the study offers an alternative approach that will rationalize targeting of the needs of the income poor particularly in local economic development planning.

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Sciforum-046240: Relationship between the Indicators of Sustainable Urban Design and Quality of Life

Ahmad Walid Ayoobi, Mehmet INCEOGLU

[1] Department of Architecture, Eskisehir Technical University, Eskisehir, Turkey

Rapid growth of urbanization and population has caused numerous problems in the current age, such as quality of life (QOL) reduction, pollution, ecosystem destruction, resources degradation, etc. Therefore, QOL, as a part of sustainable urbanization, has become an attractive concept in the recent times. Both encompass a wide aspect of human life. Many studies have been carried out on sustainable urban design and QOL concept, however, each study has defined them according to their own strategies. A rare study has been conducted to clearly define these concepts and to determine their relationship. The aim of this study is to assess the relationship between QOL and sustainable urban space design and to identify the most significant and common indicators between them.
This work was carried out using mostly library studies to review the relevant literatures including academic journal articles, books, published expert reports, and theses. The cities designed with the most sustainable strategy and high-QOL was evaluated in order to find the indicators of QOL and sustainability perspective in appropriate manner. The findings of this study show that the most common indicators among the indicators are: efficient land use, water management, transport and mobility, material reuse and recycle, amenity improvement, health and safety, accountable and efficient governance, accessibility and functionality, well-being and happiness, cultural diversity, physical statues, education opportunity, comfort and security, economy satisfaction and growth. Most of them are significantly related to the three dimensions of sustainable development, e.g., environment, social, and economy.

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Sciforum-048392: Risk assessment study on Carassius gibelio fish collected from water bodies from Bucharest

Cristina Florentina Pelcaru, Cristina Ionela Nica, Miruna Silvia Stan, Anca Dinischiotu

[1] Department of Biochemistry and Molecular Biology (DBBM), Faculty of Biology, University of Bucharest

Xenobiotics occur in the environment as a result of natural pollution and various anthropogenic sources with impact on human health through the food chain [1,2]. The oxidative stress in hepatopancreas and kidney tissues of *Carassius gibelio* (n=8 per lake) collected in August 2019 from Chitila, Floreasca, and Tei lakes and the protected natural area Văcărești Delta Bucharest. In the hepatopancreas tissues, a significant increase in the level of malondialdehyde (MDA) and a significant decrease in GSH for fish from the three lakes compared to those collected from Văcărești Delta was observed. Kidney MDA level increased significantly in the individuals from Floreasca and Chitila lakes compared to those from Văcărești Delta and Tei lake, whereas the GSH content did not vary significantly in all fish from the four water bodies. The higher level of GSH in kidney compared to hepatopancreas probably is due to the increased glutathione reductase activity. According to our data, the fish hepatopancreas is more affected compared to kidney, probably the mechanism of response to oxidative stress varying in an organ dependent manner. Our risk assessment study brings valuable information that could facilitate implementation of new measures for applying environment protection and sustainability.

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Sciforum-031206: Understanding the footprint of human needs: housing functions as the missing link

Anna Pagani, Claudia R. Binder

[1] Laboratory for Human-Environment Relations in Urban Systems (HERUS) - École Polytechnique Fédérale de Lausanne (EPFL)

To respond to the need for a drastic reduction in the environmental footprint of housing, the residential sector must meet a wide range of requirements. The opportunities for architecture are innumerable but cannot be grasped by the discipline alone. Housing is a complex system comprising a material and a human subsystem which, depending on the system's function, manifest themselves in different housing forms and residential preferences, respectively. The former have often been privileged over the latter, leading to a gap between environmentally sustainable housing and its acceptance or desirability. Whether preferences are 'priority needs' is a matter of debate; however, neglecting the vital needs that housing must satisfy can be detrimental and therefore unsustainable. This article aims to foster a better understanding of the interaction between housing's human and material subsystems in order to propose strategies that reduce housing's footprint while accounting for human needs. By means of transdisciplinary approach, we link nine housing functions identified by previous work to Maslow's (1943) basic needs. We empirically explore these links using the results of group discussions and a survey of Swiss residents (N= 878). Based on these associations, we identify the trade-offs between meeting human needs and shrinking the housing's footprint. The results of our analyses indicate that, for the majority of respondents, the ideal dwelling must first and foremost satisfy functions related to basic human needs. However, depending on the tenancy type, we observe an increased desire for the functions 'self-representation' and 'property', i.e., a greater need for self-actualization, whose fulfilment currently poses several challenges to practitioners. We conclude that assessing the fulfilment of a desired housing function can provide information about whether human needs are being met; furthermore, this function can inform decision-makers about how resistant households are to sustainability measures. By crossing the disciplinary boundaries of architecture, this understanding provides a basis for rethinking and designing environmentally and socio-culturally sustainable housing.

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Sciforum-031744: What is a sustainable neighbourhood? An approach for defining natural neighbourhood boundaries to support local scale urban sustainability assessment in Geneva.

Melissa Pang[1], Claudia Binder[2], François Golay[2]

[1] Ecole Polytechnique Fédérale de Lausanne
[2] EPFL

With notions of sustainability at the forefront of urban planning strategies today, sustainability assessment tools play an indispensable role in translating these notions to concrete outcomes. The physical characteristics and built environment of an urban system are heterogeneously expressed across space and creates distinct neighbourhoods shaped by specific local features. This heterogeneity of urban form elements and local neighbourhoods across urban systems has put the spotlight on urban sustainability assessments at the neighbourhood scale. Although the importance of accounting for intra-system spatial heterogeneity at the neighbourhood level has been emphasised by several scholars in recent years, the fundamental question of what is a neighbourhood has not been sufficiently addressed. Nonetheless, this is a particularly important topic to consider, given the potential impact of the choice of neighbourhood boundaries on any analysis performed.
Here, we present an empirical study that explicitly accounts for the spatial heterogeneity of local-scale urban form features and the significance of a neighbourhood in the canton of Geneva, Switzerland. The proposed methodology is fundamentally based on GIREC statistical units—established at a fine spatial resolution with each unit sized between a parcel and a municipality—and offers a middle-ground approach that aims to balance methodological rigour and practical considerations, such as data availability. We first established a typology of urban form features through cluster analysis, and subsequently defined local-scale functional neighbourhood boundaries using well-established criteria across the study area. Finally, an assessment of the sustainability of the resulting neighbourhoods using LEED-ND indicators was conducted; revealing significant differences between the different neighbourhood types across various components of urban sustainability. These results highlight the relevance, and argue for the importance, of incorporating local-scale approaches for more effective urban sustainability assessment to support urban planning and policy-making in the transition towards sustainability.

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Selected talks

Sciforum-031091: Beyond Tokenism: Rethinking the Approach to Sustainable Urban Development and Architecture in Cities of the Developing World

Marwan Elmubarak

[1] Marwan Elmubarak, Ph.D. AIA, LEED AP. Department of Geography and Urban Sustainability, United Arab Emirates University (UAEU)

In many cities of the developing world, the quest for sustainable solutions in planning and urban form continues to gain momentum, as often evident in isolated attempts in sustainable urban development and architectural projects. However, such sustainability-asserted projects still fall short of having real and meaningful impact. This is due, in part, to urban development and architecture practices following Western architectural styles, or models of sustainable development championed in the developed world. The results are responses lacking in contextual relevance and meaning. Further, relevance or meaning, if any, is often addressed through visual or symbolic referencing to local physical or cultural artifacts. This paper addresses this issue of relevance in sustainable solutions in two ways: from the standpoint of the cultural sustainability of such projects and the notion of preserving sense of place by embedding contextual qualities in urban solutions; and in terms of tapping into the heritage and local reservoir of time-tried sustainable practices that were developed over time. At the heart of this discussion is the question of what it means for modern responses in cities of the developing world to be both of the time and sustainable, while simultaneously be locally relevant and meaningful. Following this critique, the paper develops an argument and a practical framework for an approach to sustainable development in architecture and urbanism that is informed by local contexts, with proposed roles for urban planning policy and regulations, while considering the global market of architecture and urban planning practice.

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Sciforum-031205: Sorting organic waste: the impact of new infrastructures

Andrea Baranzini, Linda Tesauro

[1] Haute école de gestion Genève, University of Applied Sciences and Art Western Switzerland
[2] École polytechnique fédérale de Lausanne, Switzerland

In this paper, we analyze the effectiveness of a voluntary policy that aims to increase organic waste sorting. We use the distribution of little green bins in Geneva, which are intended to reduce the inconvenience cost of organic waste sorting. Geneva is an especially interesting case since it is the last Swiss canton without a bag tax. We are interested in the effect of such a policy on organic waste, as well as on overall waste. In order to isolate the causal impact of the policy, we use the difference-in-differences methodology. To do so, we conduct a survey before and after the introduction of the policy in the Canton of Geneva, as well as in the neighboring canton, Vaud. To supplement the survey data, we looked for administrative data per municipality in the Canton of Geneva and Vaud again over several years. Our results show that the introduction of the voluntary policy increases significantly the percentage of households sorting organic wastes. In addition, we find a spillover effect. The voluntary policy does not only affect organic waste, but it increases a ls o the number of other sorted categories, as well as the quantities of other waste sorted. By comparing the impacts of the voluntary policy implementation in the Canton of Geneva with the impacts of the bag tax introduction in the Canton of Vaud a few years earlier, we observe a similar increase in organic waste sorting, but a larger decrease in incinerable wastes with the bag tax introduction. Our result highlights the fact that voluntary policies can be effective and even as effective as environmental taxes on specific targets. Voluntary policies can replace the incentive effect; however, the fairness issue remains since the costs of waste disposal are not distributed according to the polluters' pay principle.

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Sciforum-032044: Synergies and trade-offs in the Sustainable Development Goals – the implications of the Icelandic tourism sector

David Cook, Brynhildur Davíðsdóttir

[1] University of Iceland

The development of major economic sectors can provide the bedrock on which long-lasting national economic prosperity is formed. Iceland's tourism sector is an example of a rapidly expanded industry in recent years, to the extent that it has become the largest sectoral contributor to the nation's economy. The growth of the sector has led to a number of sustainability impacts, thus presenting opportunities and challenges in terms of meeting the seventeen Sustainable Development Goals (SDGs) of the United Nations. Using the case study of Iceland, this paper aims to advance conceptual understanding of the synergies and trade-offs between a nation's tourism sector and performance across the 169 targets of the SDGs. Empirical results were derived from four theme-based focus groups, comprised of expert participants, who were tasked with completing score-sheets concerning their perception of the extent of synergies and trade-offs for each target. The majority (126 in number) of the mean score-sheet outcomes for the SDG targets revealed neither synergies nor trade-offs. However, 32 synergies and 11 trade-offs were identified. Many of the target synergies related to new economic opportunities, such as jobs, employment, and training for young people. Target trade-offs tended to be environmental and social. In particular, concern was voiced about the greenhouse gas emissions of the Icelandic tourism sector, which derives from international aviation, cruise ships, and rental car usage. The outcomes of this study are of particular relevance to tourism companies, policy-makers, and governance institutes, all of whom are increasingly endeavoring to link their activities with the fulfillment of the SDGs, maximizing synergies, mitigating the extent of any potential trade-offs, and potentially transforming trade-offs into synergies. Furthermore, the results are likely of interest to academics focused on researching the broad sustainability impacts of economic sectors and their contribution to meeting the visionary goals of the SDGs.

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Sciforum-048131: Evaluating Alternative Policies Aimed at Reducing Pollution from Disposable Plastics Using TOPSIS

Volkan Cakir, Jana Hilal

[1] Lebanese American University

In the last few decades, our production of single use plastics increased drastically to reach 300 million tones of plastic waste being produced each year globally. The inability of our waste management systems to efficiently deal with this overwhelming number of disposable plastics has contributed to having plastic pollution as one of the most pressing environmental issues in the world today. To address this topic, this paper first presents a literature review, including a summary of the different environmental policies tackling the reduction of pollution from single use plastics in several countries. Narrowing it down to the scope of Lebanon, an assessment of different policy alternatives is performed by first conducting three surveys aimed at engaging environmental experts in the process. This includes choosing the criteria, weighing the level of importance of each, and comparing alternatives based on those criteria. The findings of those surveys are incorporated in Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) to rank the alternatives based on the criteria. Furthermore, interviews were conducted with Lebanese environmental experts to assess the compatibility between Lebanon's approach to disposable plastics and building a circular economy. This research will provide a holistic view on all disposable plastics in Lebanon, without limiting it to one type. Moreover, the findings of this paper will provide a framework to rank municipalities according to their current management of single use plastics and recommend improved policies. Finally, the paper provides a set of recommendations to improve the overall progress of Lebanon towards a circular economy.

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Sciforum-048335: Natural Vs Cultural Tourism Development: Modeling Sustainability Concerns and Residents' Perceived Support

Vindya Hewage, Ruwan Ransinghe

[1] Department of Tourism Studies, Uva Wellassa University of Sri Lanka

Sustainable destination development is strongly linked with the support of local residents. Advocacy of community support for tourism development is critical for sustainable destination development and management. Equally, residents' support for tourism development largely corelates with their perceived impacts of tourism development. Though this thesis is explored extensively, a comparison between natural and cultural UNESCO world heritage sites seems lacking. This study compares and contrasts the residents' perceptions and support for tourism development at two UNESCO inscribed natural and two cultural tourism destinations in Sri Lanka. Theoretically motivated question of modeling the perceptual differences at cultural and natural tourist destinations was operationalized using pre-tested scales. A self-administered questionnaire fielded online secured 467 responses and partial least square structural equation modeling was used to test the proposed model. Findings indicated clear differences of residents' perceptions on tourism impacts and their support for tourism development. Different indirect impacts of tourism development at natural and cultural destinations were revealed that drive the residents' support for tourism development. In terms of perceived positive impacts of tourism, both at natural and cultural destinations, indicated similar resident perceptions. Theoretically, the study proposes two different models for natural and cultural tourist destinations, expanding the theory of perceived behavior from the perspective of residents' place attachment. Empirically, the study draws policy planners and managers specific attention at natural and cultural destinations in their destination development and management endeavors to be more effective. The prosed model is recommended to test at different tourist destinations to compare and validate the findings of this study. Further, an exploratory approach would allow deeper feelings, attitudes and behavioral intentions of residents to be incorporated in a similar scope.

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Sciforum-031266: We aren't there yet: Female consumers' unintentional sustainable apparel behaviour impacting on Sustainable Development Goal 12

Elizabeth Kempen, Mariette Strydom, Lorna Christie, Rejoice Tobias-Mamina, Mirriam Makopo

[1] Department of Life and Consumer Sciences, University of South Africa

The apparel manufacturing industry has not only brought about the Fast Fashion movement within retail but has vastly contributed to the pollution and degradation of the environment. Although consumers show very little concern for the effect of the apparel manufacturing processes or the volumes of discarded clothing polluting the environment, the research questioned whether female consumers were in fact practicing sustainable apparel behaviours without deliberately aware of such actions and the impact of these behaviours. The purpose of this study was, therefore, to determine the nature of the sustainable apparel practices of female consumers residing in Gauteng, South Africa.
A qualitative exploratory study design was used, during which 9 mini focus groups with 22 participants, allowing for a more intimate and probing conversational environment, were held with a homogenous group of female consumers who were customers of fashion retail outlets and custom-made designers in Gauteng, South Africa. The focus groups continued until data saturation of the research question was achieved. Data were verbatim transcribed after which a framework analysis of the qualitative data were performed through an open coding process. Trustworthiness of the study was addressed through employing credibility, transferability, dependability, and confirmability criteria.
The findings indicate that female consumers show unintentional sustainable apparel behaviour manifesting through quality apparel purchases, repurposing of apparel items, internalising and taking charge of apparel disposal, showing parting reluctance of apparel items, an openness to repurposed or recycled apparel and favouring locally produced apparel. Contrary to this, intentional non-sustainable apparel behaviour was characterised by once off designer items, "like-it-I-buy-it" retail practices and eco-uninvolved purchasing decisions in store.
The findings of this study show that through the unintentional sustainable apparel practices of female consumers, educational interventions are required to create a better awareness of the impact of these practices and the long-term effect it has on the environment. The sustainable practices of female consumers, although unintentional is supported by a socio-cultural value system that directs this behaviour. Sustainable Development Goal 12 referring to responsible consumption and production is unintentionally being addressed through the apparel practices of female consumers in South Africa.

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Satellite Sessions

KSS. KAUST Satellite Session | Circular Carbon Economy: Paving the Way for a Sustainable Future
ISS. IAU Satellite Session | Higher Education and Research – How universities around the world engage with Sustainability and build partnerships for the SDGs
ASS. AGEn Satellite Session | Achieving Energy Excellence through Comprehensive Management System
7SS. 7479c Satellite Session | Using Blockchain to Reduce Electronic Waste and Boost Recycling to Become Commercially Viable
ESS. ESEIA Satellite Session | Sustainable Use of Bioresources
NSS. NAHGAST Satellite Session | Enabling Sustainable Food Choices Out-of-Home – Insights from the Project NAHGAST II
ASS. AI4DA Satellite Session | Technological Innovation for Sustainable Development

Abstracts

KAUST Satellite Session | Circular Carbon Economy: Paving The Way for a Sustainable Future

KAUST Satellite Session | Circular Carbon Economy: Paving the Way for a Sustainable Future

The most recent 2020 G20 Leaders' Declaration underscored the importance of affordable and clean energy for achieving economic growth by endorsing the Circular Carbon Economy (CCE) Platform, with its 4Rs framework (Reduce, Reuse, Recycle and Remove). Despite the challenge brought about by the pandemic and indeed heightened by it, the urgency of providing affordable and reliable energy for all continues to demand innovation across fuels and technology options, including C capture, usage and storage (CCUS). The CCE platform provides a voluntary, holistic, integrated, inclusive, pragmatic, and complementary approach to promote economic growth while enhancing environmental stewardship through managing emissions in all sectors including, but not limited to, energy, industry, mobility, and food.

In this special WSF session dedicated to the Circular Carbon Economy, we will explore realistic technology options, from the required R&D innovations to industry and government deployments and commensurate C management policies.

Sciforum-047956: A research agenda for chemical, biochemical and mineralization approaches to gaseous carbon waste utilization

David T Allen

[1] Department of Chemical Engineering and Center for Energy and Environmental Resources, University of Texas, 200 E. Dean Keeton, Austin, Texas 78712.

A recent report by the National Academies of Science, Engineering and Medicine in the United States assessed the commercial viability of waste carbon utilization technologies and defined a research agenda to address key challenges. The report focused on three main pathways for waste carbon utilization: mineral carbonation, chemical conversion and biological conversion. In addition to mapping the current landscape of carbon utilization, the report informs decision making on research, development and deployment of waste carbon utilization technologies, whether motivated by a goal to improve processes for making carbon-based products, to generate revenue, or to achieve environmental goals. The report recommends a multifaceted, multiscale research agenda to create and improve technologies for waste gas utilization and recommends support of technologies throughout different stages of maturity, from fundamental research through to commercialization. The book length report is freely available at the National Academies Press web site (www.nap.edu/catalog/25232).

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Sciforum-047965: Animating the Global Carbon Cycle: the technical potential of restoration and rewilding as a carbon removal strategy

Karl Burkart

[1] Deputy Director, One Earth

What does biodiversity have to do with climate change? Are animals like wolves and tigers, toucans and tapirs, whales and sea lions, actually critical for the survival of humanity? It turns out that biodiversity and climate change are inextricably woven together. Thriving biodiversity is key to maintaining the health of land and ocean ecosystems that sequester and store carbon, and if we continue to lose species at the current rate (150 per day) we risk unraveling the global carbon cycle upon which we all depend. Conversely, if we protect and restore natural habitats for biodiversity, we can preserve our priceless carbon sinks and supercharge them with additional carbon through rewilding. We believe both strategies are necessary to achieve the 1.5°C goal of the Paris Climate Agreement.

One Earth has funded many research efforts to model mitigation strategies that limit global average temperature rise to 1.5°C. This includes a groundbreaking climate model led by German Aerospace Center and the University of Technology Sydney, published as Achieving the Paris Climate Agreement (2019), which shows that in addition to a rapid decarbonization of the energy sector, we require approximately 500 GtCO2 of carbon removal. This can be achieved largely through the restoration of forest ecosystems across 350 Mha of land in forest biomes plus additional restoration in other ecosystem types.

One Earth has funded a new paper on geospatial models for carbon removal with University of Exeter and University of Melbourne, which will be out shortly. But right now the science doesn't account for trophic cascades, and the opportunity to reintroduce keystone species into existing wild landscapes to "supercharge" these areas with carbon. A new book is in development looking at the opportunities of rewilding both on land and at sea to secure 150 GtC of carbon removal by 2100.

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Sciforum-048072: Green Hydrogen and Clean Fuel Technologies in the Circular Carbon Economy

Mani Sarathy

[1] Sr. Manager of Technology and Innovation, NEOM Hydrogen and Clean Fuels
[2] Associate Professor of Chemical Engineering, Associate Director of KAUST Clean Combustion Research Center (CCRC)

For years, hydrogen has been the forgotten clean energy source. Since it was first proposed as a renewable energy source decades ago, things like hydrogen fuel cells have failed to catch on, even as other sources of green energy generation like wind and solar have become more widespread. But thanks to some recent advances in technology and the global need to decarbonize, hydrogen may be about to get its moment. Although hydrogen is considered a clean energy source, the most common method of production today involves natural gas, meaning the process isn't completely free from fossil fuels and greenhouse gas emissions.
However, green hydrogen is created with renewable energy, meaning the entire process is carbon neutral and more sustainable. As the cost of renewable energy comes down, green hydrogen production will be more affordable. Green hydrogen can be converted to carrier molecules such as ammonia, methanol, and formic acid, for example. Scientists are researching the production and utilization of various hydrogen carrier molecules for industry, power generation, and mobility applications. In the transport sector, green hydrogen can be used in fuel cell electric vehicles as well as to produce E-fuels—synthetic fuels that result from the combination of green hydrogen and captured carbon dioxide. This close the carbon cycle of in the circular carbon economy framework.

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Sciforum-049342: Carbon is not the Enemy: Addressing Climate Change as a Design Problem

William McDonough

[1] Chief Executive of McDonough Innovation and Distinguished Research Professor at KAUST

William McDonough will discuss the concept of a Circular Carbon Economy (CCE), which offers a new way of approaching climate goals that recognizes carbon as a material and a fuel while valuing all efforts to mitigate carbon accumulation in the atmosphere. The CCE extends the concept of a circular economy (reduce, reuse, recycle) by including the word "remove" and focusing on carbon and energy flows.

The CCE concept provides a shared language leading us to action. Based on Cradle to Cradle Design™, this new language recognizes carbon's multiple forms and benefits and defines positive ways in which carbon can be used safely, productively and profitably. The CCE concept adopts language from McDonough's New Language for Carbon, originally published in the journal Nature as a Commentary, "Carbon Is Not The Enemy," which signals positive intentions: do more good rather than simply do less bad. It identifies three categories of carbon:

Living carbon: organic; flowing in biological cycles; providing the basis of living systems including marine and terrestrial environments; providing fresh food, healthy forests, and fertile soil; something we want to cultivate and grow

Durable carbon: locked in stable solids such as coal and limestone or recyclable polymers that are used and reused; ranges from short-term reusable fibers like paper and cloth to long-term building and infrastructure elements that can last for generations and then be reused, such as concrete, steel and wood

Fugitive carbon: has ended up somewhere unwanted and can be toxic – a material at the wrong dose, duration and location; includes carbon dioxide released into the atmosphere by burning fossil fuels, 'waste to energy' plants, methane leaks, deforestation, much industrial agriculture and urban development, as well as durable carbon gone fugitive in our terrestrial and marine environments, e.g., plastics

McDonough will provide examples on using the CCE approach can help organize coherent systems for carbon management on multiple scales, from the local and regional to the national and planetary.

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Sciforum-049575: Role of CCUS in Achieving Global Decarbonization Goals

Aqil Jamal

[1] Chief Technologist Carbon Management Division; Research and Development Center, Saudi Aramco, Dhahran, Saudi Arabia

Long-term global climate goals may be unattainable without Carbon Capture Utilization and Storage (CCUS). It is widely believed that CCUS is one of the few technologies available that can decarbonize both power generation and heavy industries in an economically affordable way. As countries across the planet set net-zero targets, there is a growing recognition that CCUS is essential to fully decarbonize hard-to-abate sectors. Therefore, implementation of CCUS is urgently needed because any further delay will make it harder to achieve the global climate goals. The technology is one of the key enablers for Circular Carbon Economy (CCE). This presentation highlights stationary and Direct Air Carbon Capture (DACC) in conjunction with CO2 utilization technologies that can potentially contribute to balancing emissions between sources and sinks in the CCE framework.

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Sciforum-049574: The Circular Carbon Economy | A Global Blueprint for Carbon Circularity & the Deployment of a Saudi Circular Carbon Economy Program

Noura Bint Turki Al Saud

[1] Founding Partner, Aeon Strategy and Advisory Board Member, KAUST Circular Carbon Initiative

In a time of worsening climate change and lagging global climate commitments, Saudi Arabia has introduced the concept of a Circular Carbon Economy. This framework aims to manage CO2 emissions through the 4-R approach of Reducing, Reusing, Recycling into other useful chemical forms, and removing emissions from the atmosphere through innovative, multi-purpose technology. CCE is a constructive solution to environmental and market constraints that allows fossil fuel reliant and producing nations, as well as private industry to play a more prominent role in addressing the climate emergency, and has the potential to contribute to mitigation targets while managing associated socioeconomic risks from energy systems' transformation especially for fuel-dependent, exporting and developing countries. It goes even further by promoting economic diversification and growth, and the introduction of new markets. It offers value to various stakeholders and works synergistically with other frameworks and pathways like Green Agendas and carbon markets. Guided by the global principles of coalition building, emission reduction targets, transparency and limiting negative socioeconomic impact, the CCE blueprint should be deployed by strengthening legal, structural, policy, economic and research enablers on the national and international levels. The design and implementation of a national program would require integrating CCE into a wider climate change strategy, Vision 2030 and beyond. Effective regulatory measures and entities for carbon management and circularity, thorough feasibility and impact assessment, and a tactful diplomacy and communication strategy will be crucial for the success of national pathways to carbon neutrality. The challenges inherent in effectively deploying CCE that need to be planned for and resolved range from macro level variables such as volatility in oil markets, economic stagnation, market and energy demand trends, particularly in developing nations and uncertainties around deployment of climate policies and solutions globally, to more manageable factors like project financing, streamlining across sectors, and strategic messaging to communicate the seriousness of neutrality efforts. The comprehensive development and implementation of aforementioned enablers in tandem with a strategic national program will help realize a progressive and suitable pathway to a low-carbon future for Saudi Arabia as guided by the CCE.

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Sciforum-049656: The KAUST Circular Carbon Initiative

Jorge Gascon

[1] Director at the KAUST Catalysis Center and Lead of the KAUST Circular Carbon Initiative

The Circular Carbon Economy (CCE) is a sustainable, pragmatic and cost-effective approach that recognizes the urgency to act on the climate while ensuring access to clean and affordable energy for all. Such a closed-loop system, inspired by how nature works, may help restore the balance of the carbon cycle. There is however a growing innovation gap in the development of CO2 removal, storage and reuse technologies and a real risk that we will not be able to adopt them at scale in time to meet the Paris Agreement goals. The KAUST CCI has been defined with the objective of filling this innovation gap through multidisciplinary work.
During this talk, the KAUST CCI initiative, its main thrusts and flagship projects will be introduced.

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Sciforum-049341: The Role of Policy in Carbon Management

Adam Sieminski

[1] President of King Abdullah Petroleum Studies and Research Center (KAPSARC)

KAPSARC's Guide to the Circular Carbon Economy (CCE) series of reports on key elements of the four Rs (Reduce, Reuse, Recycle, and Remove) of carbon management includes a focus by the Organization for Economic Co-operation and Development (OECD) on the importance of enabling policies that are essential to support the global transition towards net-zero greenhouse gas (GHG) emissions.

The OECD report focuses on three key thematic areas:

Enabling policies are needed across the different dimensions of CCE- including a wide array of different technology options and approaches. A supportive policy environment is essential to achieve a rapid transition to a more circular carbon economy, including through better valuation (pricing) of emissions and through innovation.

Financing and investment for CCE, focusing on carbon capture, use and storage (CCUS) and emphasizing longer-term benefits and economies of scale and incorporating elements of Environmental, Social and Governance (ESG). ESG practices should include CCE-related technologies, such as CCUS to balance the risks of reliance on any single approach.

Accelerating CCE technology and business model innovation, with governments encouraging both "push" and "pull" polices. Public funding of R&D remains a core "push" role for governments to drive innovation, though the design of R&D support. On the "pull" side, public procurement can be an effective tool to create markets for low-carbon materials with a knock-on effect on innovation, including potentially for CCUS.

There are two key messages from the OECD report. First, achieving sustainable net-zero emissions will require a global effort that uses a whole-of-economy approach to policy-making and addresses the full range of sectors, and employs a full array of policy tools and new approaches. Second, the CCE represents an important part of this holistic approach towards achieving net-zero emissions, and covers most of the key dimensions of the challenges that must be addressed.

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Abstracts

IAU Satellite Session | Higher Education and Research – How universities around the world engage with Sustainability and build partnerships for the SDGs

IAU Satellite Session | Higher Education and Research – How universities around the world engage with Sustainability and build partnerships for the SDGs

The proposed session aims to make the case at the Sci Forum for higher education's role for sustainable development, and will present the work of the International Association of Universities (IAU) on its strategic priority HESD (Higher Education and Research for Sustainable Development) and how it fosters HESD around the world. Strategies for increased collaboration between universities and other higher education institutions (HEIs) around the world will be outlined, supported by presentations from representatives from the IAU Global HESD Cluster. The session will focus specifically on SDG 3: Good Health and Wellbeing; SDG 4: Quality Education; and SDG 17: Partnerships for the Goals.

In 2021 and beyond, partnerships between different stakeholders, with diverse backgrounds and based in multiple parts of the world, are not only possible, but essential for implementing the UN Agenda 2030. To do so, innovative approaches, flexibility and persistence are needed to form strong and fruitful partnerships, while working in silos may be needed at times it certainly is an obstacle to the development of the new approaches to the challenges we face today. Higher education in particular has a huge potential to foster interdisciplinary and innovative approaches to partnership-building. The UN Agenda 2030 and the associated goals call for such new approaches. Higher education should be seen as an essential partner in the processes addressing the challenges on the way to a more sustainable future. At the same time, HEIs are uniquely placed to set an example for other sectors.

Next to SDG 17: Partnerships for the Goals, two other SDGs have been very much in the focus of global attention lately: SDG 3 and SDG 4. While all Goals are interconnected, the sessions will go into more depth on these two while linking them to larger challenges the world is facing. The pandemic has shown how SDG 3 is crucial in many ways – aim include to prevent infectious diseases and pandemics, better train health personnel, research vaccines and cures, bring attention to mental health but also finding digital health solutions.

SDG 4 is at the heart of UNESCO's Roadmap to 2030 and the Education for Sustainable Development (ESD) strategy; education is a key enabler for all 17 SDGs. This renewed emphasis on education as a means to foster societal transformation comes at a critical point, as educational institutions continue to grapple with the challenges caused by the COVID-19 pandemic and take advantage of opportunities to develop a more peaceful and sustainable world.

The flagship initiative of IAU's HESD work is the IAU Global Cluster on HESD. Launched in 2018, the Cluster work will be used as the main example for the realisation of a multi-stakeholder partnership for the SDGs during the session at WSF. The Cluster consists of 16 lead HEIs, each leading on one of the SDGs 1 to 16; IAU leads the work on SDG 17: global partnerships. The lead institutions each work with up to 8 'satellite' institutions to advance on a particular SDG and initiate concrete projects, while ensuring synergies among all goals. Furthermore, the Cluster promotes the role and potential that HEIs globally have in order to achieve the SDGs and the UN Agenda 2030. HEIs have already started to address the SDGs in multiple ways, including at teaching, research, leadership, and campus operations. The Cluster encourages collaboration and a holistic method to work with the SDGs, focusing specifically on the whole institution approach.

Within the overarching goal of "Accelerating the implementation of the 2030 Agenda for Sustainable Development" (UN SDG Summit 2019), the Cluster has two concrete objectives: First, to serve as a resource and networking hub for HEIs around the world for institutions already engaged in SDGs

locally and seeking partnerships, and those starting to engage with the SDGs and who turn to the Cluster for collaboration and guidance to translate and advance SDGs in local, national and international contexts. Second, the IAU Global Cluster aims to serve as a global voice for higher education and sustainable development. The IAU advocates for this at the annual UN High Level Political Forum and IAU International Conferences, and other events where IAU is invited to speak.

The session will start with short input presentations, providing examples of practice and steps for building cooperation networks such as the IAU Global Cluster. Representatives from HEIs from the IAU Global Cluster will share their experience and exchange with participants, to identify potential steps to establish and maintain partnerships for the SDGs, in particular SDG 3 and SDG 4. The questions of how collaboration and education will look like in a sustainable future will be the guiding principle throughout the session. Participants will be presented with practical approaches of how partnerships can be formed, projects initiated, and multi-stakeholder approaches coordinated.

Sciforum-050632: Cross-Sectoral Partnerships in Higher Education and Why We Need Them for Sustainable Development

Jonghwi Park

[1] Academic Programme Officer and the Head of Innovation and Education at UNU-IAS, United Nations University

Without a doubt, higher education plays a key role in achieving the 17 SDGs, not only in advancing and providing research-based solutions to interconnected global issues but also in educating the future generations to build a sustainable and just society. To achieve such mission, it is vital for higher education sector to come out of the conventional academia and reach out for cross-sectoral partnerships. This talk presents three tangible approaches to such partnerships that the United Nations University Institute for the Advanced Studies of Sustainability (UNU-IAS) has been undertaking: 1) providing inclusive access to higher education (postgraduate degree programme at UNU IAS), 2) connecting higher education with communities (Regional Centres for Expertise on ESD (RCEs)) and 3) translating multi-disciplinary research into EDS curriculum in higher education (under the framework of ProSPER.NET). It will illustrate promising cases from each approach as well as key takeaways from the unique multistakeholder partnerships.

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Sciforum-050158: Strengthening the role of Higher Education and Research for Sustainability: IAU HESD

Hilligje van't Land

[1] Secretary General International Association of Universities (IAU)

In 2021 and beyond, partnerships between different stakeholders, with diverse backgrounds and based in multiple parts of the world, are not only possible, but much needed and even essential to ensure proper implementation of the UN Agenda 2030 and to meet the goals set. To do so, innovative approaches, flexibility and persistence are needed to form strong and fruitful partnerships; working in silos is also needed at times yet is often is an obstacle to the development of the new approaches to the challenges we face today.

Higher education has a huge potential to foster innovative approaches to partnership-building. The UN Agenda 2030 and the associated goals call for such new approaches. Higher education should be seen as an essential partner in the processes addressing the challenges on the way to a more sustainable future. At the same time, HEIs are uniquely positioned to lead by example and building bridges with and inspiring other sectors.

The International Association of Universities (IAU) has advocated for the role universities and other higher education institutions (HEIs) play in support of sustainable development since the early 1990s. The adoption of *Transforming our World: the 2030 Agenda for Sustainable Development* and the related Sustainable Development Goals (SDGs) by the United Nations General Assembly in 2015 was the start of an increased interest in sustainable development beyond the initial circles. Since 2016, this necessity for action and engagement with the UN agenda is reflected in the IAU's strategy for its thematic priority Higher Education and Research for Sustainable Development (HESD). HEIs have increasingly engaged with SDGs, as shown in the results presented in the *IAU 2nd Global Survey Report on Higher Education and Research for Sustainable Development*. Next to its surveys on HESD, the IAU HESD team coordinates the work of the *IAU Global HESD Cluster*, offers specialized publications, represents the IAU community and values at events. Very practically, it updates the specialized IAU-HESD portal and uses social media to share initiatives on sustainability in higher education around the world.

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Sciforum-050633: Sustainability and Partnerships for the SDGs at Karolinska Institutet

Ole Petter Ottersen

[1] Rector, Karolinska Institutet, Sweden

The United Nations Agenda 2030 has inspired Karolinska Institutet's (KI) vision and strategic plan. At Karolinska, we are rethinking Higher Education inspired by the Sustainable Development Goals (SDGs), and brining on board students as change agents. Our institution is well-positioned in Europe and the world. It is crucial to foster international academic cooperation in a time of geopolitical tension and polarization.
KI is a member of the IAU SDG 3 cluster together with Universitat Oberta de Catalunya, Makerere University, Universidad de Caldas, Gadjah Mada, West Sydney University and University College Dublin, together representing three continents. These and other "Glocal" approaches for partnerships will be presented, including the KI–Makerere University sustainable health and Stockholm Trio (KI, Stockholm University and KTH Royal Institute of Technology).

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Abstracts

ASS. AGEn Satellite Session | Achieving Energy Excellence through Comprehensive Management System

AGEn Satellite Session | Achieving Energy Excellence through Comprehensive Management System

Climate action means stepped-up efforts to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-induced impacts, including: climate-related hazards in all countries; integrating climate change measures into national policies, strategies and planning; and improving education, awareness-raising and human and institutional capacity with respect to climate change mitigation, adaptation, impact reduction and early warning. It requires mobilizing US$100 billion annually by 2020 to address the needs of developing countries in moving towards a low-carbon economy. Every country in the world is already experiencing the devastating effects of climate change.

As one of Indonesia's largest companies, Astra is committed to contribute to climate action through implementation of energy efficiency & renewable energy throughout our 238 Affiliated Companies. To manage such diverse business lines, Astra has established a comprehensive Energy Management System (EnMS) known as "Astra Green Energy (AGEn)".

Adapting from ISO 50000 series and government regulations, AGEn covers robust tools to assess the EnMS implementation, analyze energy performance, and technical guidance. The implementation of AGEn is monitored regularly through corporate assessment.

One of AGEn main products is the "4.0 Mining Operations". Astra has excelled in implementing real-time monitoring system and big data analysis to achieve energy optimization. Combined with renewable energy (Solar PV) installation and powerful EnMS, Astra has reduced more than 37 million liters of fuel.

Since 2015, AGEn has delivered major contribution such as reducing 4,308 terajoule energy; 0.15 billion USD saving; and reducing 461 thousand tonne CO2-eq.

This session will focus on explaining the importance of participation from all stakeholders to work together to reduce greenhouse gas emissions by using renewable resources.

Sciforum-050849: Achieving Energy Excellence through Comprehensive Energy Management System

Mohammad Taufan

[1] Environment and Social Responsibility Department Head PT Astra International Tbk

As one of Indonesia's largest companies, Astra is committed to contribute to climate action through implementation of energy efficiency & renewable energy throughout our 238 affiliated companies. To manage such diverse business lines, Astra has established a comprehensive Energy Management System (EnMS) known as "Astra Green Energy (AGEn)". This initiative is formed to support Indonesia's target in reducing 29% of CO2 emission in 2030 as well as achieving 31% of renewable energy mix in 2050.

Since 2015, AGEn has been developed to align with ISO 50000 series and government regulations. AGEn covers robust tools to assess the EnMS implementation, analyze energy performance, and technical guidance on energy saving. This set of tools & system is then paired with internal energy expert development to further optimize energy saving initiatives. Through more than 39 energy expert in Astra, AGEn is then monitored regularly through corporate assessment. Entering the sixth year of this initiative, AGEn has delivered major contribution such as reducing 4,308 terajoule energy; 0.15 billion USD saving; and reducing 461 thousand

ton CO2-eq. As a sign of recognition for this innovation, Astra has also received Subroto Efficiency Energy Award from Indonesian Ministry of Energy and Mineral Resources in 2017.

Sciforum-050850: Best Practice: PT Astra Daihatsu Motor

Muhammad Herdimas

[1] Energy Expert PT Astra Daihatsu Motor

As one of Astra's leading implementer of AGEn, Astra Daihatsu Motor has implemented AGEn throughout its office & manufacturing plant since 2016. PT Astra Daihatsu Motor is the biggest automotive manufacturing company in Indonesia, which legally follows the policies of PT Astra International Tbk and government regulations in Indonesia to reduce carbon emissions. PT Astra Daihatsu Motor has implemented energy management system based on ISO 50001 since 2013, started by forming a team consists of internal energy auditors. In 2015, we started to conduct energy audit with a pilot project in one of PT Astra Daihatsu Motor facilities/plants. This initiative is then replicated in other plants such as Plant 4 which by 2020 has started forming a team of auditors to conduct audit.

Based on Plant 4 energy audit conducted in Q4 2020, assessment result indicates that the biggest finding derives from Painting Division. Thus, the Plant 4 team then developed energy awareness activities within the Painting Division to increase energy efficiency. By implementing machine operations optimization, Plant 4 team could eliminate machine usage during changes in operational shift.

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7SS. 7479c Satellite Session | Using Blockchain to Reduce Electronic Waste and Boost Recycling to Become Commercially Viable

7479c Satellite Session | Using Blockchain to Reduce Electronic Waste and Boost Recycling to Become Commercially Viable

Every second year a new smartphone, a growing demand for electronic devices since pandemic started - the electronic industry is booming, the demand for electronics is higher than ever before. But while we tend to put all our knowledge and energy into building new products we forget to care about the end of their life cycles: the waste they cause.

According to the Global e-waste monitor by UN in 2019 we produced 53.6 M tons of e-waste, less than 20% of it was recycled. The fate of the other 80% is unknown and undocumented. What we know so far, is, that there is a lot of movement of e-waste, mostly from high-income to low-income countries, where the waste is handled by the informal sector under dangerous conditions for the health of the workers.

Yet old devices are real gold mines: smartphones, laptops, refrigerators contain valuable metals and rare earths, their recycling is economically and ecologically worthwhile. According to the UN report the value of raw materials in the amount of 2019 is equal to approx. 57 billion USD. But how can we achieve to make the lost 80% e-waste available for professional recycling?

Purpose of the session stream

The Session stream will focus on the question, what we need to accomplish the shift from discarded e-waste to do more professional recycling and how this can pay off to achieve the SDGs by 2030. The proposed possibility contains two solutions - one that is connected to ethical consumption, the other is connected to transparency of supply chains. The stream can be divided in two streams, each one can be 30 minutes long, including 10 minutes Q&A.

Part 1: Awareness for e-waste: How to incentivize consumers to do more recycling

The so called hibernation of old electronic devices in households is building a barrier to circular stocks. The question is how to motivate people to do more recycling? One aspect is to build awareness for the topic generally with the gaming approach.
Purpose of the session stream is to focus on the question how the gaming approach can motivate citizens to care for their waste and how this is connected to topics like urban mining and circular societies.
Part 2: Blockchain as gamechanger

Climate change, complex supply chains and sustainable shopping: Our world is going through a major shift that effects how we manufacture, sell and buy goods. Businesses have to meet a lot of requirements in the environmental, social and governmental sector to proof their sustainable manufacturing and fair labour conditions. One possibility has become to bring transparency to supply chains, supported by blockchain. Purpose of the session stream is to focus on how this can be done in the electronic industry with a positive effect on recycling.

Sciforum-050676: Awareness for E-waste: How to Incentivize Consumers to Do More Recycling

Nina Schmulius

[1] lecturer at University of Applied Sciences of the Grisons, writer, speaker and founder of 7479c

18 million children, 12.9 million women, including an unknown number of women of childbearing age, may be at health risk because of informal disposal of electronic waste, says the report Children and digital dumpsites: e-waste exposure and child health by WHO from June 2021. And the amount of informal disposed e-waste is raising: In 2019 we produced 53.6 million tons of e-waste, less than 20% reached formal waste management or recycling systems, according to the UN report Global e-waste monitor 2020. The report also predicts global e-waste will reach 74 million tons by 2030.
How can we make sure to achieve SDGs about gender equality, decent work and sustainable consumption and production patterns under these circumstances?
On the basis of current insights and studies 7479c started to examine the relation between ethical consumption, transparent supply chains and reduction of the amount of e-waste this year. The result is a model that uses gamification and scientific knowledge about digital community building to build awareness for the problems of e-waste and boost formal waste management.

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Sciforum-050677: Blockchain as Gamechanger

Nina Schmulius

[1] lecturer at University of Applied Sciences of the Grisons, writer, speaker and founder of 7479c

Our world is going through a major shift. Not only on the side of social and ecological changes, but also in the economic sphere: More than ever people want to live in alignment with their values, even if they are shopping lifestyle goods. Surveys by Bitkom and KPMG show: More than 80% of consumers pay attention to sustainability while shopping. But how can businesses take their responsibility and show their customers the information about the origin, journey and impact of their products? One answer to it is tracing the product's journey with the support of blockchain. And this can be used for the electronic industry too: Accordingly to the Global e-waste monitor 2020 by UN we still do not know, what happened to more than 44 million tons of e-waste in the year 2019. With a digital twin on the blockchain every component of an electronic device could be traced and made accessible for professional recycling. Manufacturers of electronic devices could reuse recycled metals and turn their environmental impact into brand value.

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Abstracts

ESS. ESEIA Satellite Session | Sustainable Use of Bioresources

ESS. ESEIA Satellite Session | Sustainable Use of Bioresources

Bioresources, are widely available in many locations from agricultural and forestry areas to urban and aquatic environments. These materials have a tremendous potential to contribute to the sustainable production of energy. Furthermore, their role as carbon-sinks, especially when used as feedstock for the production of chemicals and materials is still not totally untapped. In fact, their sustainable use is a nondismissible tool to achieve the desired carbon-neutrality in the short-term, and also for the future carbonnegative society. This section stream aims to bring together the most innovative developments that demonstrate these bioresources applications.

Section 1 will showcase the innovations on the production and use of bioenergy in different geographical and socio-economic contexts. Section 2 will highlight the industrial use of biomass for the production of marketable products besides biofuels. In Section 1, Bioenergy production and utilization in the urban context will be presented by professor Michael Bongards from the faculty of Computer Science and Engineering at Cologne University of Applied Sciences (TH Köln, DE). Many different methodologies for Bioenergy production and utilization in order to increase plant efficiency and sustainable long-term energy production will be addressed. Moreover, Mr. Markku Huhtinen in the department of Environmental Engineering at Savonia University (Savonia UAS, FI) will present Improved Solid Biofuels for Africa. He has made significant advancements in research for applying biochars for water management (e.g. stormwater treatment, mine water treatment, industrial water treatment). The efficiency of charcoal production and utilization of bio side streams and develop extracts' production for energy, agricultural and water treatment in Africa will be introduced. In Section 2, Mr. Fabio Maria Montagnino, who is the head of Innovation and Entrepreneurship at The Cyprus Institute (CYI, CY), will present An overview of Bioresources as materials for energy applications. Cellulose nanomaterials for energy application (ex. solar cells, triboelectric nanogenerators, lithium-ion batteries), biomass derived carbons for hydrogen storage, insulation materials, carbon captures, solar fuels, solar still desalination, and 3D printed structures will be addressed. Next presenter is Professor Bozidar Santek from the department of Biochemical Engineering in the University of Zagreb (UNIZG-PBF, HR). He will present Balancing of Bioresources and Energy Production by addressing bioresource value chain, biorefinery concept and its processes, smart systems and smart energy planning, and the biobased economy. Furthermore, Dr. Luis C. Duarte from the Portuguese National Laboratory for Energy and Geology (LNEG, PT) will present Biomass fractionation: The search for an industrial process standard, where the most recent advances on the pre-treatment processes required to effectively upgrade lignocellulosic materials in the biorefinery framework will be discussed in relation to their current TRL and economic constrains. Lastly, Potential Applications of Lignin will be presented by professor Marlene Kienberger from the institute of Chemical Engineering and Environmental Technology at Graz University of Technology (TU GRAZ-CEET, AT). Finding sustainable alternatives for different materials and energy sources is important. Plant biomass, especially wood, is the most important renewable material. Therefore, she will introduce the utilization of todays and potential tomorrows application of lignin, which makes up 18-30% of vascular plants.

Sciforum-049765: An overview of Bioresources as materials for energy applications.

Fabio Montagnino

[1] Head of Innovation and Entrepreneurship The Cyprus Institute

The climate crisis is asking for a fast and deep transition of the energy system. Renewable energy generation, storage and efficiency will require a dramatically growing amount of materials, arising a serious issue in terms of availability and sustainability. This could be the case for components of PV panels, batteries and insulation materials that are needed for the renovation of building stocks. Bio-based solutions could mitigate such risks and offer even higher performances than conventional materials.
Residuals from the agri-food industry could be functionalised and become suitable materials for energy applications, in a circular economy framework. The overall life cycle assessment of the systems will be improved, as treatment of the biobased components at the end of their life would be easier and less polluting. Bio-based strategies could also be relevant towards the development of innovative solar based processes, as fuel production and seawater desalination.
An emerging industrial interest for bio-based materials in energy application is recorded all around the world. This potential demand is triggering a growing number of research and innovation activities, which are spanning from the development/adaptation of new supramolecular structures to the optimization of specific applications and processes.
The presentation will offer a panoramic view of the state of the art through a collection of cases. Cellulose nanomaterials for energy application (ex. solar cells, triboelectric nanogenerators, lithium-ion batteries), biomass derived carbons for hydrogen storage, high performing insulation materials, bio-based materials for carbon capture, catalysers for the generation of solar fuels, matrixes for solar still desalination will be addressed, as well as additive manufacturing strategies to achieve the desired properties.

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Sciforum-049764: Balancing of bioresources and energy production

Božidar Šantek

[1] Faculty of Food Technology and Biotechnology University of Zagreb, Pierottijeva 6, 10000 Zagreb, Croatia

Human activities are often related to the use of fossil fuels which stimulate the global warming as a consequence of greenhouse gases (e.g. CO2, CH4, N2O) emission. The shift from fossil fuels to sustainable and renewable bioresources (or biomass) can successfully overcome the issue of global warming and the use of fossil fuels. In the world, biomass is more evenly distributed than fossil sources and causes less environmental and social concerns. The main attribute of biomass is huge variety of plant species with varying morphology and chemical composition. It can be divided depending on the type of carbohydrate in biomass on sugar, starch and lignocellulose containing raw materials. In different biotechnological processes biomass can be successfully converted into biofuels (e.g. bioethanol, biodiesel or biogas), heat, power or added values chemicals. The sustainable overall use of biomass can be done in the biorefinery system what will be the focus of this lecture. It is characterised by the multifunctional concept that uses biomass for the sustainable production of different worthy products. The biorefinery is usually composed of following stages: the pretreatment and preparation of biomass, separation of biomass components and the subsequent conversion and product purification steps. There are two basic approaches for biorefinery concept implementation: bottom-up and top-down. Bottom-up biorefinery approach is characterized by the spreading of current biomass processing facilities (the production of only one or a few products) into a biorefinery with the aim to obtain an enlarged range of products and/or an increase of usable biomass fractions through the connection to additional technologies. The top-down approach is highly integrated smart system established for the use of various biomass fractions and generation of different products for the market (zero-waste generation). In order to fulfil human biofuels (energy) demands in near future it will be necessary to develop highly integrated bioprocess systems for biofuels production that will be based on the innovative production and purification systems as well as efficient distribution and storage systems. For renewable biofuels systems it will be necessary to identify optimal system configuration based on the holistic approach. It has to include cross-sector collaboration in order to define the most efficient planning of biofuels (energy) production, distribution and storage in order to fulfil biorefinery concept. The full application of biorefinery concept in economic human activities will result in the sustainable circular biobased economy.

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Sciforum-050487: Biomass Fractionation: The Search for an Industrial Process Standard

Luis C. Duarte[1], Florbela Carvalheiro[2], Bruno Sampaio[1], Pedro Martins[1], Inês César[1], Ivone Torrado[1], Cristina Oliveira[1], Rui André[2], Paula Costa[2], Filomena Pinto[2]

[1] Unidade de Bioenergia e Biorrefinarias, LNEG - Laboratório Nacional de Energia e Geologia, I.P., Estrada do Paço de Lumiar, 22, 1649-038 Lisboa, Portugal
[2] Unidade de Bioenergia e Biorrefinarias, LNEG - Laboratório Nacional de Energia e Geologia, I.P., Estrada do Paço de Lumiar, 22, 1649-038 Lisboa, Portugal

The efficient use of biomass resources, most noteworthy, lignocellulosic biomass, in the biorefinery framework, implies the use of biomass fractionation or deconstruction processes, the so-called biomass pre-treatment processes.
In this work, a comprehensive description of the currently available processes will be given, and their development stage will be thoroughly discussed based on the use of the TRL scale. Furthermore, their differential industrial applicability will also be discussed, highlighting the interconnections between biomass composition, fractionation processes traits (such as process chemistry and operational conditions), and the subsequent biorefinery processes.
Finally, special attention will be given to the technical challenges related to the industrial implementation of these processes, namely the issues related to the process mechanisation and continuous operation of (high-solids and high-pressure) biomass deconstruction reactors.

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Sciforum-050057: Improved Solid Biofuels for Africa

Markku Huhtinen

[1] Manager of Education and RDI, Energy Technology, Savonia UAS

Wood based charcoal is the most used fuel for cooking in many African countries and the consumption of charcoal in Africa is predicted to double by 2030. The most part charcoal is still produced unsustainably with very low recovery rate (below 20%) from natural tree species by small scale charcoal makers using traditional earth mound kilns, regrettably contributing to the high deforestation rates contributing to increase GHG and reduced carbon sinks.
In Scandinavian countries, which are world's leading countries in terms of the share of biofuels in energy production as a feedstock for biofuels are used agricultural, forestry and industrial side streams thus maintaining carbon sinks through sustainable forest management. Suitable biofuels for energy production in industrial applications would be chips and bark and in smaller applications pellets or briquettes, which could be produced with high recovery rate. Also efficiency of charcoal production could be improved significantly and it is made research work related to produce valuable side streams from charcoal production e.g. for fertilizing purposes. In addition to combustion charcoal has other potential applications for example in soil improvement in nutrient-poor areas or in the filtration of sewage water
Piloting and promotion of technologies presented in this presentation in Africa have been aim of ESEIA-network for several years.

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Sciforum-049763: Innovations and potential of bioenergy production and utilization in the urban context

Michael Bongards

[1] Faculty for Computer Science and Engineering Science: metabolon Institut

Bioresources, are widely available in many locations from agricultural and forestry areas to urban and aquatic environments. These materials have a tremendous potential to contribute to the sustainable production of energy. Furthermore, their role as carbon-sinks, especially when used as feedstock for the production of chemicals and materials is still not totally untapped. In fact, their sustainable use is a non-dismissible tool to achieve the desired carbon-neutrality in the short-term, and also for the future carbon-negative society. This section stream aims to bring together the most innovative developments that demonstrate these bioresources applications. Section 1 will showcase the innovations on the production and use of bioenergy in different geographical and socio-economic contexts. Bioenergy production and utilization in the urban context will be presented. This includes a short overview of research activities of the partners of the research network "Biorefineries, Biobased Economy and Bioresource Utilization." Many different methodologies for Bioenergy production and utilization are in development in order to increase plant efficiency and sustainability. An outlook for long-term energy production will be addressed.

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Sciforum-049767: Potential Applications of Lignin

Marlene Kienberger

[1] Assistant Professor Graz University of Technology

The increasing consumption of fossil fuels is associated with environmental issues such as global warming and environmental pollution. Therefore, efforts have been made to find sustainable alternatives for different materials and energy sources. Plant biomass, especially wood, is the most important renewable material. The main constituents of vascular plants are cellulose with a content of 42–51%, hemicellulose with a content of 24–40%, and lignin with a content of 18–30%. Cellulose and hemicellulose represent the cell walls, while lignin acts as a strengthener thereof, and inhibits enzymatic degradation, regulates water transport, and demonstrates antibacterial activity. The utilization of todays and potential tomorrows application of lignin is summarizes in this presentation.

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Sciforum-050485: Sustainable Biorefinery Model Based on Black Sea Seaweeds from Romanian Costal Area

Sandor Bartha[1], Luis C. Duarte[2], Florbela Carvalheiro[2], Santino di Berardino[2], Pedro Martins[2]

[1] BIO-C-ECOIPAR LTD, 10-Castanilor Street, Ro- 520004, Sf. Gheorghe, Romania
[2] Unidade de Bioenergia e Biorrefinarias, LNEG - Laboratório Nacional de Energia e Geologia, I.P., Estrada do Paço de Lumiar, 22, 1649-038 Lisboa, Portugal

Seaweeds (marine macroalgae) have a high potential to, partially, replace the terrestrial biomass in advanced biorefinery concepts. This feedstock can either be purposely grown as an energy crop in coastal areas or collected from the natural environment. Seaweeds can also be washed ashore as a consequence of algal blooms.
These blooms that occur over coastal areas throughout the world create significant ecological problems, and have disturbing effects on the touristic, fishing and maritime transport activities, and hence have a strong economic impact. Furthermore, this impose significant clean-up costs to be supported by the local municipalities. For instances, the Romanian Coast is seasonally affect by such blooms, and this year in one location sited in South part of the Romanian costal area more than 4500 tons of seaweeds were collected in
August, which were transported to the local landfill.
In this work, the state of art regarding seaweed chemical and physical composition and currently used technologies for their disposal and/or valorisation are presented and discussed based on the constrains imposed by their production/collection origin. In order to overcome some of the limitations regarding seaweeds usage, a biorefinery model targeting biogas production was developed, which encompasses a biomass pre-treatment step that was optimized.
Finally the integration of the sustainable biogas production and cogeneration into small scale fish farms or local touristic units situated in Romanian coastal areas, is presented.

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Abstracts

NSS. NAHGAST Satellite Session | Enabling Sustainable Food Choices Out-of-Home – Insights from the Project NAHGAST II

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To achieve sustainable development, food consumption and production patterns have to change. In this context, lifestyles (e.g. characterized by eating out-of-home) and diets (following sustainability trends) are important aspects to be considered. Regarding production, we have to improve dishes taking into account the sustainability of ingredients, cooking and handling processes of food, food waste, and leftovers as well as classical product characteristics such as price, revenue, contribution margin, and profit. Regarding demand, notable research topics are consumer choices and how they can be altered to consider sustainability aspects, starting from the selection of the most sustainable dish to finishing the plate.

This session provides insights into ongoing transdisciplinary research as a starting point for discussing possible future activities. The following aspects/papers are highlighted:

1. Which information, tools, knowledge, competences do kitchens need to be able to plan, cook and serve sustainable meals?
    a. Introduction into the NAHGAST tool for sustainability assessment.
    b. Feedback from 20 cafeterias using The NAHGAST tool will be presented.
2. Which method can be recommended to assess quantity and quality of leftovers in cafeterias?
    a. Two methods were compared: videotaping returned plates and weighing leftovers. Both methods were applied for a period of one week; 57.000 plates were analyzed.
3. Is it more effective to apply type 1 nudges (focusing on choice-architecture) or type 2 nudges (providing information) to influence consumer choices towards the most sustainable dish?
    a. Results are based on three intervention weeks and three practitioners with a harmonized experimental design.

Sciforum-049663: Insights from NAHGAST real-world-laboratories: Increasing sustainable food choice and reducing plate waste with the use of nudges in the out-of-home catering sector

Pascal Ohlhausen[1], Nina Langen[1], Kerstin Damerau[1], Magdalena Becker[1], Ramona Leusch[1], Fara Steinmeier[2], Silke Friedrich[2], Tobias Engelmann[2], Melanie Speck[3], Petra Teitscheid[2]

[1] Institute of Vocational Education and Work Studies, Department Education for Sustainable Nutrition and Food Science, Technische Universität Berlin, 10587 Berlin, Germany
[2] Institute of Sustainable Nutrition, University of Applied Sciences Münster, 48149 Münster, Germany
[3] Osnabrueck University of Applied Science, Faculty of Agricultural Sciences and Landscape Architecture, Am Kruempel 31, 49090 Osnabrueck, Germany

One of the most relevant systems that has to become more sustainable to achieve the Sustainable Development Goals by 2030 is the global food system. Its sustainability impact can be easily understood looking at current data estimating the global food systems' worldwide impact on greenhouse gas emissions at around 21 up to 42 percent. For a closer look into this system the out-of-home catering sector is suited since it is, after the retail sector, the second biggest food sales channel for instance in Germany. The German wide real lab project NAHGAST (2015-2018 and 2019-2021) investigates the success of different means to increase the out-of-home catering sectors sustainability. Building on the project results by NAHGAST I, NAHGAST II investigated different type 1 and type 2 nudging interventions in harmonized but real-world settings. Food choice behavior (type 1 and 2 nudges) and plate waste behavior (type 2 nudges) were studied. The first set of interventions investigated (i) the impact of nudges on (sustainable) food choice behavior. Three cafeterias promoted the most sustainable dish of the day with different nudges focusing on choice-architecture via best counter positions, top menu positions as well as nutrition and sustainability information via labels. The second set of interventions explored (ii) the impact of type 2 nudges of informational campaigns via posters regarding guest plate waste behavior. Four cafeterias used these posters with one version per intervention week: single prompts or single social norms, combined messages via prompts & social norms, as well as setting-specific information. Real-world-lab data was collected between autumn 2019 and summer 2020. To compare the nudge interventions, a harmonized menu plan across the cafeterias was introduced and dishes were sustainability-optimized using the NAHGAST tool to assess the sustainability of a dish. Besides, baseline measurements were carried out in each cafeteria. To avoid menu monotony between the intervention weeks, cooling-off periods were implemented. Results reveal, (i) that to increase sustainable food choices all three tested nudging variants can be used, but counter position and label nudges worked best in NAHGAST II. Regarding (ii) plate waste behavior, results indicate that combined messages, setting-specific information and single prompts were an effective way to reduce plate waste. Furthermore, the finding that nudges have to be implemented and monitored setting, situation and dish specifically to provide the most impact is relevant to mention.

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Sciforum-049662: Comparison of two methods for determining plate waste: videotaping returned plates and weighing leftovers

Tobias Engelmann[1], Anita Menzel[1], Magdalena Becker[2], Pascal Ohlhausen[2], Nina Langen[2], Ramona Leusch[2], Fara Steinmeier[1], Silke Friedrich[1], Melanie Speck[3], Petra Teitscheid[1]

[1] Institute of Sustainable Nutrition, University of Applied Sciences Münster, 48149 Münster, Germany
[2] Institute of Vocational Education and Work Studies, Department Education for Sustainable Nutrition and Food Science, Technische Universität Berlin, 10587 Berlin, Germany
[3] Osnabrueck University of Applied Science, Faculty of Agricultural Sciences and Landscape Architecture, Am Kruempel 31, 49090 Osnabrueck, Germany

The analysis of plate waste can help to identify their causes in guest behavior and in the kitchen. For this it is necessary to be able to measure the residues per tray precisely and reliably. It is not only the amount of leftovers that is important, but also which product groups are left over. Meat and other animal products have a greater ecological impact than vegetable components. This is why we recorded the foodwaste in a differentiated manner.
In research, different methods are used to record the remains of plates, depending on the question: They can be determined directly by weighing or indirectly by visual assessment (on-site or based on photo or film recordings).
Various studies have previously examined the validity of the visual measurement method and were able to demonstrate a high level of reliability of the method. This was done in a standardized test framework under laboratory conditions. For example, standard portion sizes were used, and the students were actively involved in the process. In living labs, in contrast, research is carried out directly in ongoing operations. As a result, the observations reflect a more precise picture of the realities in practice. Though, the study design can only be standardized to a limited extent, since the research has to adapt to the local conditions. It was therefore necessary to check whether the visual method also delivers reliable results in practice in the NAHGAST living lab.
Within the project, the amount of plate waste per tray was analyzed in detail by visual assessment in several catering establishments. The comparison of the visual assessment with the weighing of the remains in one company shows that there is no significant difference between the results of the two methods and that the visual assessment proves to be a much more practical method in research practice.

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Sciforum-049661: Enabling sustainable food choices out-of-home – Insights from the project NAHGAST II

Melanie Speck[1, 2], Lynn Wagner[1], Felix Buchborn[1], Tobias Engelmann[3], Fara Steinmeier[3], Silke Friedrich[3], Nina Langen[4]

[1] Wuppertal Institute for Climate, Environment and Energy gGmbH, Doeppersberg 19, 42103 Wuppertal, Germany
[2] Osnabrueck University of Applied Science, Faculty of Agricultural Sciences and Landscape Architecture, Am Kruempel 31, 49090 Osnabrueck, Germany
[3] Muenster University of Applied Science, Institute for Sustainable Nutrition (iSuN), Corrensstr. 25, 48149 Muenster, Germany
[4] TU Berlin, Institute of Vocational Education and Work Studies, Division of Education for Sustainable Nutrition and Food Science, Marchstr. 23, 10587 Berlin, Germany

Public catering has become increasingly important in recent years. With increasing annual customers, the sustainability potential of the sector is also growing continuously. Small changes in kitchen practices and food offers can thus be multiplied into a significant positive impact on environmental challenges, such as climate change or loss of biodiversity due to the large number of servings. Moreover, it is easier to influence eating habits in the public catering, in contrast to private households.
Within the framework of the NAHGAST project, extensive real-lab experiments in those kitchens have been carried out in recent years. Always with the guiding question: Which information, tools, knowledge, competences do kitchens need to be able to plan, cook and serve sustainable meals? Therefore we gained several comprehensive results, e.g. the NAHGAST online tool, which is a free online tool, for the assessment of menus. Within a field study several kitchen (n=20) tested all provided instruments.
The results show that the nationwide implementation of recipe revision according to scientific guidance – such as concrete target goals for the GHG emissions per serving – can save up to 44% of resource use in the German business catering sector (which corresponds to 3.4 million tons of resources per year) and as much as 40% of GHG emissions (0,6 tons GHG emissions per year).
The results show that public catering can reduce its material and carbon footprint by 20% overnight. Moreover, the findings show indications for the sustainable transformation of public catering. Nevertheless, it must be noted that these are some first steps of the transformation, which will require further changes with even greater impacts and political activities.

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Abstracts

ASS. AI4DA Satellite Session | Technological Innovation for Sustainable Development

ASS. AI4DA Satellite Session | Technological Innovation for Sustainable Development

The social and economic lockdowns accompanying the COVID19 pandemic have brought about the sustainability agenda decidedly conflicting effects. On the one hand, global reduction in traffic and industrial emissions have for instance slowed down air pollution, surface water contamination, energy demands, consumer-heavy lifestyles and given wildlife a reprieve. Yet, on the other hand, the pandemic severely exacerbated a diverse set of phenomena adversely affecting global efforts for greater sustainability- from peaking levels of plastic pollution related to the use of disposable personal protective equipment PPE and single-use items waste management and tilting the job market to aggravating development dynamics reflected in the placement of the economic entities and individuals along the global value chains and deepening educational gaps and technological divides.

The unfurling processes mentioned above only serve to reiterate and reinforce the urgency to address the progressively more dire issues of sustainable development in our diverse stakeholder capacities as public institutions, private entities, community networks or single human individuals. What's more, with humanity entering the Decade of Change, and, essentially, the current generation being the last generation that can actually make a difference for the better and manage the comprehensive and informed implementation of sustainable practices in all spheres of life, it is more than imperative we make use of youth energy for change and technological advances that have proved to have a steeper innovation curve than ever.

The session on "Technological Innovation for Sustainable Development'' engages with the impact of innovative technologies, namely AI, IoT, IoB and Blockchain on Sustainable Development. The three pillars of exploration "Environment – Society - Economy'' allow for multi- and cross-disciplinary research papers in relation to environmental protection and climate change, renewable energy and waste management, healthcare optimisation, financial/banking services accessibility, education for the future of work, increased legitimacy of political decision-making, ecosystem-conscious agriculture, protection of heritage sites and indigenous cultural traditions, transparency in the development sector, the promulgation of human rights along the global supply chains, socially responsible business productivity and profitability maximization, etc. The session would reflect four of the "Innovative technologies-SDGs" dynamics. First, innovative technologies as enablers in achieving the SDGs and their potential positive impact. Second, innovative technologies as inhibitors of the realisation of certain sustainable development targets and the potential ways in which the negative impact can be understood and curtailed. Third, innovative technologies as an industry in and of itself need to be measured against the SDGs. Four, the need for industry-tailored and regionally-specific regulations for innovative technologies that would serve to further boost the 2030 Agenda in the "new normal" of the post Covid19 world.

Sciforum-050183: AI-Powered Digital Health Tools to Optimize Decision Making and Improve Health Outcomes at Primary Health Facilities in Tanzania

Megan Allen, Ally Salim

[1] Inspired Ideas - Tanzania

Introduction: Health stakeholders in LMICs are working towards a more effective and inclusive healthcare ecosystem that delivers high-quality care to all. A fundamental step to achieving these goals is to strengthen the capacity of lower-cadre healthcare providers and give them tools for more accurate, evidence-based decision making. The Elsa Health Assistant (Elsa), developed by a multidisciplinary team in Tanzania, uses expert knowledge and advances in AI to assist lower-cadre healthcare providers in identifying the cause of a patient's illness, predicting medication adherence, taking actionable next steps based on national guidelines, and identifying disease clusters for more precise diagnostics.

Methods: Elsa was designed and developed following human-centered approaches to ensure the priorities, motivations, and capacities of users were taken into account. Custom causal disease models were built in close collaboration with medical experts and researchers to optimize decision making from a cause and effect perspective. Using mixed-method approaches across pilots of the tool in three regions, we evaluated Elsa's performance, ability to support decision making, and feasibility of integration into primary care.

Results: Elsa is used by 53 healthcare providers across various levels of care and covers 50 conditions. Continuous evaluation of the tool's implementation has shown that Elsa is effective at optimizing health decisions, increasing provider confidence, and identifying the cause of many conditions as accurately as a medical doctor. In-depth interviews have also illuminated challenges in usability and barriers to uptake, which are used by the development team for tool iterations.

Conclusions: The learnings generated from these pilots have shown that Elsa is a viable solution for optimizing clinical decisions, and that it's possible and cost-effective to leverage AI-powered, specialist-level decision making at lower-level care facilities. These tools have the opportunity to support the achievement of the Sustainable Development Goals (SDG3) by allowing clinicians to make confident, informed decisions that reduce misdiagnoses, decrease unnecessary antibiotic prescriptions, and improve the overall health of their communities.

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Sciforum-050180: Ethical AI reinforcing sustainability

Mfon Udechukwu

[1] AI 4 Development Agency - Nigeria

Ethical AI reinforcing sustainability
by Mfon Udechukwu
The fourth industrial revolution technologies (e.g., Artificial Intelligence AI, machine learning, etc.) have rapidly become mainstream, offering unprecedented transformation that supports breakthroughs in achieving Sustainable Development Goals (SDGs). This profound shift in the use of AI technologies to support every sector, from disruptions in current business trends to enabling new business models, creating new markets at an accelerated scale and supporting health professionals in the fight against covid-19, has led to discussions about ethical AI and its ability to facilitate sustainability.
The importance of AI in addressing challenges affecting sustainable development has been reaffirmed by the United Nations (UN) and other regional organisations. This is seen through many pushes by stakeholders towards exploiting AI to achieve the 17 UN SDGs. For example, the UN acknowledges that AI is advancing dramatically and transforming our world socially, economically, and politically. Furthermore, the Organization for Economic Co-operation and Development (OECD) AI principles on Ethical AI centers around AI benefitting people and the planet by driving inclusive growth, sustainable development, respect for the rule of law, human rights and democratic values, etc1.
The potential of AI to reinforce sustainability with relevant evidence shows that AI may act as an enabler on 134 targets (79%) across all SDGs2, generally through a technological improvement, which may allow overcoming present limitations. For instance, under SDG1 fighting poverty, the proliferation of AI awareness and education can empower people in Africa with access to information, job opportunities, and services to improve living standards. Presently, we have witnessed the transformational dominance of financial services through mobile phones, such as Kenya's M-Pesa, reaching the underserved, including women, who are important drivers for sustainable poverty eradication.
Finally, accelerating AI infrastructural development in low-income countries will support the achievement of SDG3 (health and well-being) by providing early diagnosis, facilitate the delivery of blood transfusions to remote regions and improve early disaster response.
1 https://www.oecd.org/going-digital/ai/principles/
2 https://www.nature.com/articles/s41467-019-14108-y#Sec1

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Sciforum-050179: How is Artificial Intelligence supporting the development of smart and inclusive cities and what role do city leaders play?

Elena Gabriela ARDELEAN

[1] AI 4 Development Agency - Austria

According to the United Nations Department of Economic and Social Affairs, 55% of the world's population lives in urban areas. This is expected to rise to 68% by 2050.[1] The growing urbanisation presents new challenges, and smart cities seem to be part of the solution. Besides, AI has the potential to facilitate the development of smart cities. But what is a smart city?

Following ITU's definition[2] a smart sustainable city is "… an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects." As such, a smart city is one in which local authorities or city leaders manage to strike the right balance between three key components: technology, citizens' needs and rights, and regulatory framework. In our perspective, this is one, if not the greatest challenge for local authorities in the 21st century.

Technology in cities was historically mainly used to gain insights and knowledge on data and the complexity of urban spaces. More recently, progress on new technologies, in particular Artificial intelligence (AI), opens up new opportunities for tech applications to improve and innovate water, waste and energy infrastructures, urban services and promote empowered and resilient communities in smart cities. From AI for governance, for infrastructure and mobility, to AI for education and citizen participation, these solutions can significantly contribute to a better decision-making process, and a resilient and sustainable urban life.

However, local authorities and other smart city stakeholders face several challenges when it comes to the implementation of those applications. It is with this objective in mind that this paper is introducing a policy toolkit and a governance framework for guiding principles for AI to support city leaders operate AI in their cities and empower citizens in the decision-making process.

[1]
https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanizatio n-prospects.html
[2]
https://www.itu.int/en/ITU-T/ssc/Pages/info-ssc.aspx#:~:text=%E2%80%8B%E2%80%9CA%20smart%20sustainable%20city,generations%20with%20respect%20to%20economic%2C

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Sciforum-050181: Integrated Usage of Blockchain Technology and AI for Smart Sustainable Development in Asia

Angela Sarafian[1], Alberto Trkstra[2]

[1] AI 4 Development Agency - Bulgaria
[2] Diplomatic World Institute - Belgium

While much attention has already been devoted to blockchain applications and FinTech prospects of cryptocurrencies, the more up-to-date trends have been moving the focus on exploring the technology's user-centric approach for enabling smart and sustainable developments in very diverse areas. A range of nascent adaptations of the original blockchain concept are currently active, or in development, fully trusting in the robustness of the operational mechanism where there is no single entry point of vulnerability or monopoly over access and contents within the powerful second- level functionality of the internet in the context of shared ledgers that involve a multitude of peer-to peer nodes and access to real time data. Similarly, while Artificial Intelligence (AI) largely refers to the computer modelling used for developing analytical insights and predictive diagnosis combining data, iterative processing and intelligent algorithms, predominantly associated with business optimisation and tech innovation for its own sake, the advanced technology has actually been showing great potential to positively impact many aspects of society, economy, environment etc. that are subject to targeted engagement by the SDGs.

With blockchain and AI being considered as the main driving technologies for the next digital generation, their integrated usage progressively attracts the attention of both researchers and international development practitioners to better understand and set the exact blueprint parameters that result in adoption impact implications, comprehensively inspecting the trade-offs in security, scalability efficiency, on the one hand and accessibility, trustworthiness and privacy on the other hand. From government coordinated efforts to private business endeavours and break-through research, these innovative advances oftentimes intersect with tangible socio- economic, environmental, security and human development impacts directly impacting the Sustainable Development Agenda.

The paper explores the genesis, nature and development characteristics of both blockchain and AI. Then it goes on to the tech community offsetting an unfolding of other potential uses of both technologies that would be of interest to policy-makers and global governance agenda-setters for a wide array of sustainable development issues. The research undertakes to initiate a scholarly and practical inquiry into the possibilities that blockchain and AI, when employed together, can reinforce each other's' strong point, while mitigating each other's' weaknesses in favour of tackling some of the most trying sustainability challenges in international development. The employed case studies and examples further provide context by spanning across the different sub-regions of Asia, whether on the cusp of Industry 4.0 or already a paragon of innovation.

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Sciforum-050182: The introduction of Eco-literacy and systems-thinking approach in education systems: Fostering eco-conscious citizens for climate innovation

Hsin Yen Phoebe Mok

[1] beHuman Inc - Singapore

Following the recent IPCC report 1 statement that it is now "unequivocal that human influence has warmed the atmosphere, ocean and land." 2, grassroots communities such as social media influencers, environmental activist, and the scientific community have gathered forces to educate and raise the awareness on how to interpret the statistics within the IPCC reports, and to provide hope on what actions we can take to prevent further environmental degradations. Cross sector innovation, such as the work of Breakthrough Energy venture founded by Bill Gates, is now furthering its backing for climate innovation through investments in clean energy companies. In his introductory video on the website, Gates mentioned that innovation that can provide massive breakthroughs in climate innovation has not yet been created 3, leading the objective to find foster youths who can carry out its mission in the hands of educators. The challenges of transforming individual's attitude and mindset towards climate reality, and to empower youths to act, requires investments in the technical skills, and soft skills development that promotes the character and mindset necessary to meet humanities global challenges today. It is with that objective, the paper seeks to introduce theoretical and applied frameworks of eco-literacy and systems-thinking approaches, alongside curriculums of humanistic pedagogies of nonviolence communication to encourage youth innovators to transform their thinking processes they may need to create a more sustainable society.

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