15-16 SEPTEMBER 2022

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GLOBAL SUMMIT ON

ADVANCES IN EARTH SCIENCE & CLIMATE CHANGE

ADV. ESCC 2022

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DAY 1

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Global Summit on Advances in Earth Science and Climate Change

September 15-16, 2022

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Macroalgal defense against competitors and herbivores

I. Bubak[2], G.Budzałek[1] and S. Sliwinska-Wilczewska[1]

[1]Division of Marine Ecosystems Functioning, Institute of Oceanography, University of Gdansk, Poland
[2]Division of Hydrology, Institute of Geography, University of Gdansk, Poland

Macroalgae are the source of many harmful allelopathic compounds, which are synthesized as a defense strategy against competitors and herbivores. Therefore, it can be predicted that certain species reduce aquaculture performance. Herein, the allelopathic ability of 123 different taxa of green, red, and brown algae have been summarized based on literature reports. Research on macroalgae and their allelopathic effects on other animal organisms was conducted primarily in Australia, Mexico, and the United States. Nevertheless, there are also several scientific reports in this field from South America and Asia; the study areas in the latter continents coincide with areas where aquaculture is highly developed and widely practiced. Therefore, the allelopathic activity of macroalgae on coexisting animals is an issue that is worth careful investigation. In this work, we characterize the distribution of allelopathic macroalgae and compare them with aquaculture locations, describe the methods for the study of macroalgal allelopathy, present the taxonomic position of allelopathic macroalgae and their impact on coexisting aquatic competitors (Cnidaria) and herbivores (Annelida, Echinodermata, Arthropoda, Mollusca, and Chordata), and compile information on allelopathic compounds produced by different macroalgae species. To recognize the allelopathy impact of macroalgae on coexisting animals, many investigation methods are necessary, from field observation to co-culturing experiments in mesocosms. Most studies on the allelopathic activity of macroalgae on target aquatic animals are characterized by a specific method suited to test those organisms and environment. The allelopathic activity of macroalgae can change according to the taxonomic position of the donor and target organisms, as well as their habitat. This work gathers the current knowledge on the phenomenon of macroalgal allelopathy and their allelochemicals affecting aquatic animal (competitors and predators) worldwide and it provides future research directions for this topic.

Biography

I. Bubak is an employee of the Institute of Geography at the University of Gdańsk. However, she is a marine biologist by training. Since the beginning of her scientific career her research interests have been focused on algae, in particular on diatoms. Her main topic was to describe and distinguish specific diatom communities characteristic for ecologically diverse water bodies (mainly lakes), and then to use them to reconstruct the development of lakes during the Holocene, taking into account the record of climate change.

Research on diatoms turned her attention to other groups of algae. Therefore, her next research problem is, to determine how algae, especially phytoplankton, evolve today. Do they adapt to changing environmental conditions or do they succumb to pressure? How do they respond to changes, whether they are caused by human activity or natural processes? Is their role in the ecosystem changing? Are their impacts on other species changing?

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Revitalising embodied community knowledges as leverage for climate change engagement

Laura Donkers
Independent Artist-Researcher, UK

Human survival is threatened by climate breakdown and ecological collapse. This levies huge responsibility on society to address how present modes of living have created this threat. Yet the scale of these crises and lack of wisdom to act can be overwhelming, so how will citizens become more informed and motivated to act? This paper proposes that cultivating *communities of practice* (Wenger) around low carbon citizenship can help generate discrete engagement strategies that rouse public attention towards changing attitudes and behaviours. Affective engagements are relatable, values-oriented and framed towards the priorities, knowledges, capacities, and lived experiences of participants. Such an approach is explored in the case study, *Grow Your Own Community,* that sought to engage marginalised communities with decarbonisation activities through the strategic repositioning of their *embodied community knowledge* (ECK). This community of practice helped to motivate and mobilise local participation by integrating Carbon Literacy with the situated, practical capacities that already lay within the community. Key findings reveal that revitalising a community's existing body of knowledge to engage people with climate change knowledge creates the conditions for generating community-led mitigative action.

Biography

Laura Donkers is an ecological artist and researcher specialising in changing perceptions of climate change through creativity and co-production. She holds a BFA Hons in Fine Art, MFA in Art, Society, Publics, and PhD in Contemporary Art Practice.

Laura Donkers Practice-led PhD research was carried out at University of Dundee and awarded AHRC Creative Economies studentship. She has received several awards to develop research opportunities in Aotearoa New Zealand. She successfully delivered a series of the Scottish Government's Climate Challenge Fund decarbonisation projects that encouraged local food production and waste reduction. These projects integrated local traditional knowledge on growing food with methods of delivery that reflected embodied societal structures. New ground was created in terms of how the community influenced project development promoting a new vision for co-created community working practices, leading to improved climate change engagement at all levels of local society – schools, local community groups, local organisations, businesses.

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Study on physicochemical properties of high-density sludge sediment in copper mine after phytoremediation

Jinchun Xue[1], Ruoyan Cai[1], Li Tan[1], Zhuyu Zhao[1] and **Zhaoyang Zhang[2]**

[1]School of Energy and Mechanical Engineering, Jiangxi University of Science and Technology, China
[2]Dexing Copper Mine, Jiangxi Copper Corporation Limited, China

When the High-density Sludge (HDS) process is adopted to treat copper mine wastewater, a large amount of sediment is generated. Sediment can be used as the guest soil after fertilization and restoration, which plays a role in the ecological reclamation of mines.

To explore the effect of different phytoremediation approaches on the physicochemical properties of HDS sediment, the untreated sediment was employed as the control group, whereas sediments repaired by six kinds of plants, including slash pine (*Pinus elliottii* Engelmann), Chinese white poplar (*Populus tomentosa* Carr.), black locust (*Robinia pseudoacacia*), *Photinia* × *fraseri*, *Ligustrum quihoui* and *Ligustrum japonicum* Thunb, were selected as the test groups. Then, the water content, pH, organic matter, total nitrogen, total phosphorus, total potassium, available phosphorus, and available potassium contents in the sediment samples were analyzed.

The results showed that, among the six experimental groups, *L. japonicum* group achieved the most significant effects on sediment pH and total nitrogen content. Meanwhile, the slash pine group improved the sediment organic matter content, available phosphorus content and available potassium content to the greatest extent. The black locust group had the most significant effects on the sediment total phosphorus content.

As discovered from the grey correlation analysis results, slash pine has the best comprehensive effect of improving the physicochemical properties of sediment among the six plants, followed by black locust, *Photinia* × *fraseri*, Chinese white poplar, *Ligustrum quihoui* and *Ligustrum japonicum* Thunb.

Biography

Xue Jinchun, from Ganzhou, China, is a professor of safety engineering at the School of Energy and Mechanical Engineering, Jiangxi University of Science and Technology. He graduated from Southern Institute of Metallurgy in July 1992 with a bachelor's degree in mining engineering, a master's degree in mining engineering from Southern Institute of Metallurgy in 2003, and a doctorate in safety technology and engineering from Central South University in 2012. Mainly engaged in research on rock dynamics, mine slope stability and mine ecological restoration.

A preliminary study on the Earth's evolution and condensation

Guo Shaofeng
Development and Research Center of China Geological Survey, China

Through many field geology observations, the authors find that sandstone and carbonate rocks, which were originally thought to be sedimentary, have magmatic characteristics and should classified as magmatic rather than sedimentary rocks. Combining this information with the principles of Bowen's reaction series, the authors infer that the Earth has evolved gradually from high temperature to low temperature and, through crystallization differentiation, has experienced the following stages: high melting point metal to ultramafic rock to mafic rock to neutral rock to acidic rock to sandstone to carbonate rock to mudstone to ice. Since fossils that preserve the remains of creatures, such as fossil fish, occur in magmatic rocks rather than sedimentary rocks, the organisms were not aquatic but lived in high-temperature fluids with magmatic characteristics. Therefore, the authors conclude that during the evolution of rocks from high temperature to low temperature, biological evolution from high temperature to low temperature also occurred on the Earth and that carbon-based life did not originate in the ocean but in high-temperature carbon-containing fluids; this is a subversive statement. This understanding contradicts the original interpretation, that is, that fossils formed under normal temperature and pressure conditions. This point explains the Cambrian explosion and later mass extinctions. Therefore, the extinctions of organisms may be results of the Earth's constant cooling. With decreasing temperature, the conclusion is that the Earth will become unsuitable for human habitation. This time span will be much shorter than the 4.5 billion years estimated by astronomers. Therefore, people all over the world should reduce military conflicts, enhance studies of human living environments and explore the future of humanity.

Biography

Guo Shaofeng, male, born in June 1970, Ph.D., professor-level senior engineer, graduated from China University of Geosciences (Beijing), majoring in mineralogy, petrology and mineral deposits, mainly engaged in mineral exploration and regional structural research. During his postdoctoral research from 2010 to 2012, he found that iron ore, which was originally believed to be the cause of sedimentation, was essentially hydrothermal cause, and took this as an enlightenment idea, and in the following research work, he put forward unique insights in the evolution of the earth, biological evolution and climate change. He has published more than 10 papers and two monographs, and has won the second prize of the Ministry of Natural Resources for Scientific and Technological Progress and the second prize of the Prospecting Achievement Award of Hebei Provincial Bureau of Geology and Mineral Resources.

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Influence of different phytoremediation on soil microbial diversity and community composition in saline-alkaline land

Fengxia Li[1], Yongzhong Guo[2], Zhangjun Wang[1] and **Yangxiu Mu[1]**

[1]Institute of Agricultural Resources and Environment, Academy of Agriculture and Forestry Sciences, Institute Ningxia, China
[2]Institute of Desertification Control, Academy of Agriculture and Forestry Sciences, China

Soil salinization is one main environmental factor restricting plant growth and agricultural prod-uctivity. However, phytoremediation is one of the important means to improve saline-alkali soil by planting halophytes or salt-tolerant plants. In order to study whether there are differences among soil microorganisms in different phytoremediation, the effects of four plants, including alfalfa (MX), oil sunflower (YK), maize (YM) and ryegrass (HMC) on soil physicochemical properties, enzyme activity and microbial community diversity and composition were investigated using 16S rRNA bacterial and ITS fungal gene-based method and others methods in this study and the relationships between microbial community structure and soil physicochemical properties, enzyme activity were analyzed. The results showed that all plants treatments significantly decreased pH, TS (total saltinity) and BD (bulk density), while increased OM (organic matter), TN (total nitrogen), AN (available nitrogen), TP (total phosphorus), AP (available phosphorus), TK (total potassium) and TPOR (total porosity), and the number of nitrite bacteria reduced by planting at the same time. Except for YM, other treatments significantly increased the number of nitrifying and denitrifying bacteria compared with CK, while only YK increased that of fungi. dditionally, all plants increased the activity of nitrite reductase and decreased that of urease. More interestingly, plants treatments shifted microbial community compositions, and only YM significantly decreased the bacterial diversity and increased the fungal diversity. edundancy analysis suggested that TK, pH, BD, TS, AN, OM and nitrite reductase, lignin peroxidase were the key environmental factors that shaped the bacterial community structure, while that of fungi was mainly driven by OM, nitrite reductase, urease and lignin peroxidase. The results indicated that MX and YM are the best choice for remediation of saline-alkali soil. These data can provide certain theoretical basis for the further restoration of saline-alkali land.

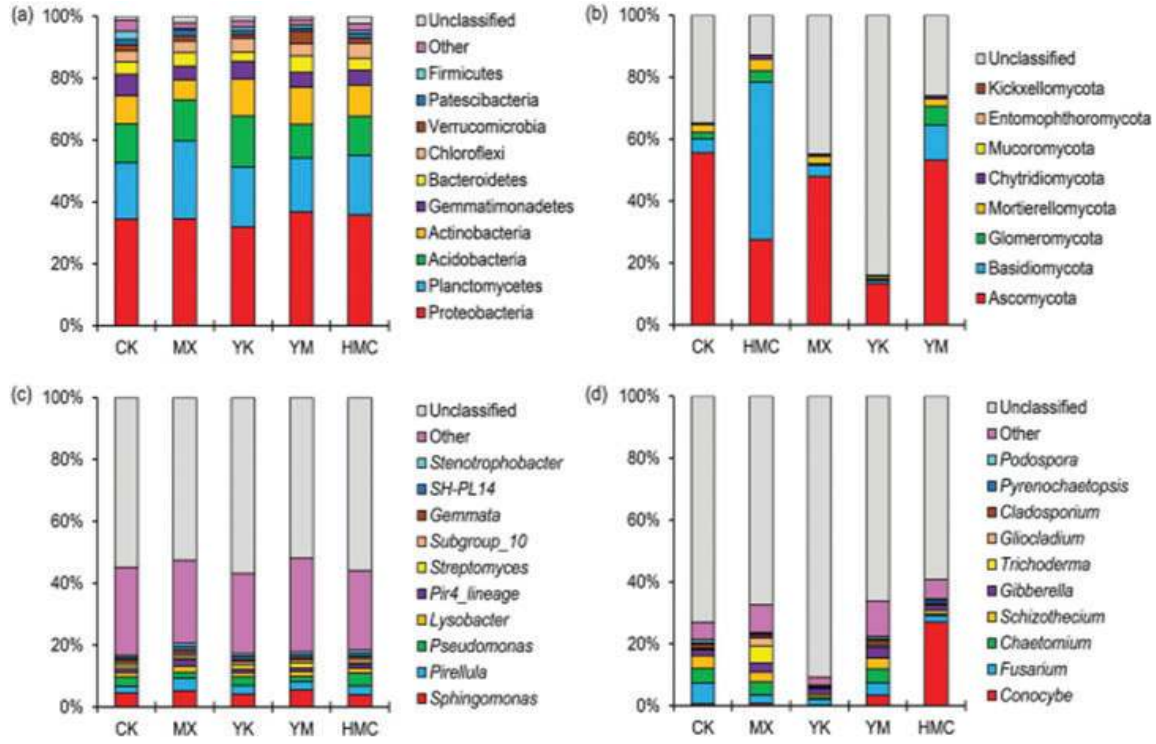

Figure . The top 10 16S rRNA gene-based bacterial (phylum (a) and genus (c)) and ITS gene-based fungal (phylum (b) and genus (d)) community compositions at the phylum and genus level in five treatments.

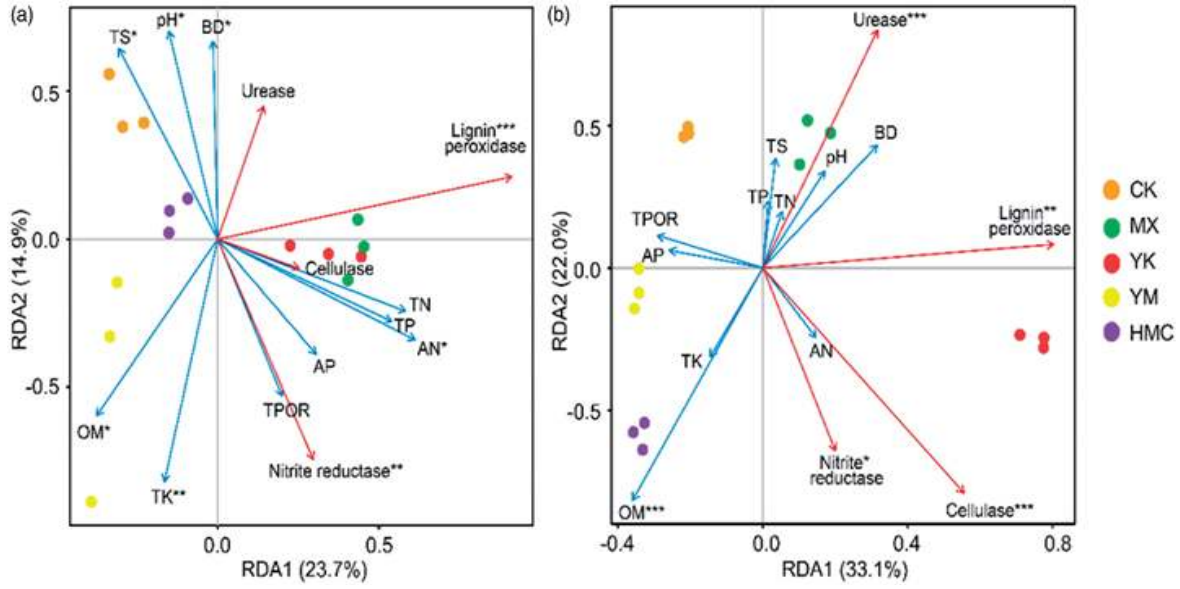

Figure 2. Redundancy analysis (RDA) of the bacterial (a) and fungal (b) communities and soil properties and enzyme activities for individual samples. Soil factors included pH, total saltinity (TS), organic matter (OM), total nitrogen (TN), available nitrogen (AN), total phosphorus (TP), available phosphorus (AP), total potassium (TK), bulk density (BD), total porosity (TPOR), nitrite reductase, urease, cellulase and lignin peroxidase. The direction of the arrows indicates correlations with the first two canonical axes, and the length of the arrows represents the strength of the correlations. ? p?0.05 was tested by a Monte Carlo permutation test.

Biography

Fengxia Li, Female, Dr. , Researcher, works in the Institute of agricultural resources and environment of Ningxia Academy of agricultural and Forestry Sciences. She mainly engaged in the research on soil improvement and utilization of saline alkali land, soil microbial processes and functions. She visited the Grassland Research Center of the Academy of Agricultural Sciences of New Zealand for one year from October 2013 to October 2014, did research on "the impact of global climate change on grassland ecology and the functional genes of microorganisms involved in nitrogen cycle ". In recent years, She has presided over 15 projects including two National Natural Science Foundation project of China, Ningxia Natural Science Foundation project, the key research and development project of Ningxia Hui Autonomous Region, the the Ningxia returned overseas students' innovation team project, etc. She won three third prizes for scientific and technological progress of the autonomous region, 10 patents were authorized, more than 30 articles were published. She wrote one book and edited four books with colleagues.

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Research on lighting systems that realize multiple light environments in a single space

Shin'ichi Warisawa, Koichi Ota, Yuki Ban and **Rui Fukui**
Graduate School of Frontier Sciences, The University of Tokyo, Japan

Improvement of indoor environments has attracted attention from various aspects such as health and economy. In this study, we focus on the lighting environment in which it is difficult to provide a good lighting environment for individual in a single space with multiple people.

In this study, we developed a method to realize multiple independent lighting environments simultaneously in a single space as shown in Fig.1. We applied time-division light multiplexing as a method of transmitting multiple lights in a single space, and synchronously controlled the light source and the shutter device that blocks the light to present lighting as a high-speed blinking light that is imperceptible to humans.

Experiments were conducted using the developed system. A "multiple lighting environment" was realized by using a time-division system combining a shutter device and a light source. It was confirmed that the developed system could deliver multiple lighting conditions independent of each other. It was found that he application of the system removes the potential inhibition of lighting manipulation behavior caused by sharing the lighting environment with others, and facilitates the setting of the desired lighting environment by each individual in the same space.

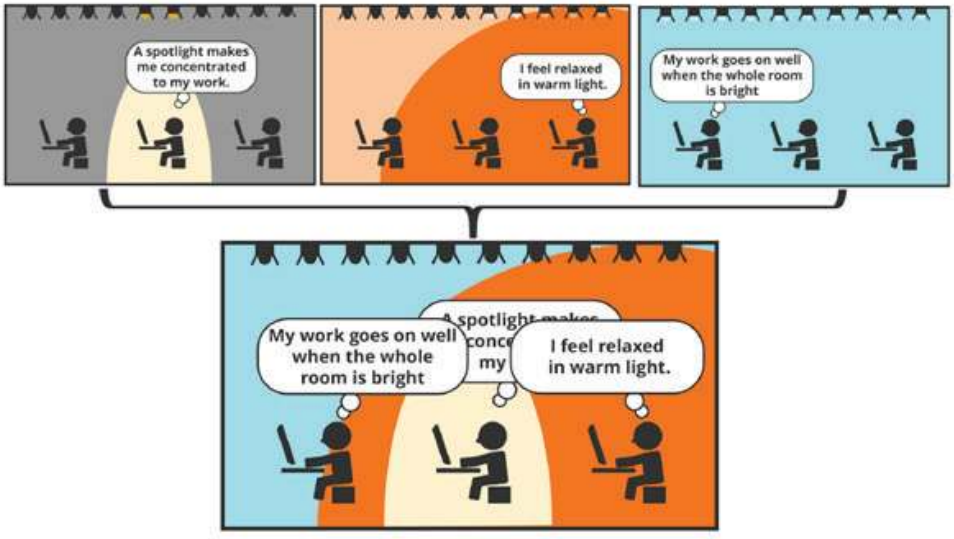

Fig.1 Concept of Multiplexed Lighting Environments

Biography

SHIN'ICHI WARISAWA is a professor at the Department of Frontier Sciences at the Univ. of Tokyo. From 1994 to 2000, he served as an Assistant Prof. of Tokyo Institute of Technology. Since 2000 he has been working at the University of Tokyo. He was a visiting researcher at Massachusetts Institute of Technology from 2010 to 2011, and a visiting professor at Université Jean Monnet in 2016. His current research focuses on wearable/ambient human health monitoring. Research cores are nano/micro sensing devices fabrication and sensing information technology application for human well-being.

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Design and analysis of lightweight Alkali-Activated slag and fly ash geopolymer mortars using ANFIS-SSO

Talasila Bhavani Chowdary[1] and **V Ranga Rao**[2]

[1]*Vardhaman College of Engineering, India*

[2]*KLEF, India*

In recent years, the geopolymer will considerably replace the role of cement in the construction feld. Generally, geopolymers have advantageous characteristics such as minimal shrinkage, minimal creep, and high compressive strength, respectively. In the literature, some of the geopolymer-based concrete is designed which attains low compressive strength and inadequate compressive strength computation. Hence, in this research paper, lightweight geopolymer mortar with base material for the based concrete mix is designed. The base material is considered as fy ash (FA) and alkali-activated slag (AAFS). The main components of lightweight geopolymer mortar are insubstantial burnish aggregate and AAFS binder or alkali-activated FA. The mixed concrete design compressive strength is computed with the Artifcial Intelligence (AI) technique. Here, Adaptive Neuro-Fuzzy Inference Controller (ANFIS) with Salp Swarm Optimization (SSO) is utilized to compute the urging force of the concrete mix. SSO is used to compute the optimal learning rate to fnd out the urging force of the concrete. The preliminary parameter's potential was inspected with the relations of variant urging force in insubstantial geopolymer mortar. The performance is evaluated by changing the temperature and binder content. The proposed method with an intended concrete mix result illustrates the performance. The proposed method is compared with existing methods of Artifcial Neural Network (ANN).

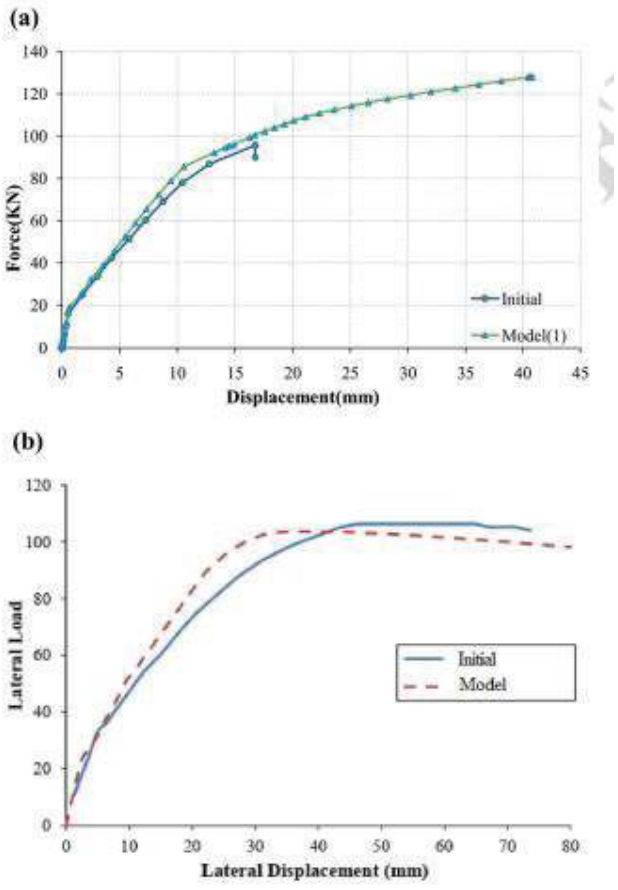

Fig. 9 Analysis of displacement Seismic loads with beam-column joint behavior (**a**) force and (**b**) lateral load

Biography

Talasila Bhavani chowdary is graduated in 2013 from JNTU Kakinada. She completed her post graduation from Acharaya Nagarjuna University in the year 2015. She is a Research Scholar,Koneru lakshmaiah Education Foundation, Department of Civil, and also currently working as Assistant Professor, Vardhaman College of Engineering, Department of Civil, Hyderabad. Her areas of interest include materials and Earthquake Resistant Design of Structures, Fracture Mechanics.

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Legal and policy frameworks to harmonize and mainstream climate and disaster resilience options into municipality integrated development plans: A case of Zambia

B. Banda[1], D. van Niekerk[1], LD. Nemakonde and **C. Granvolka[2]**

[1]Environmenral Science and Management Research Unit, North West University, South Africa
[2]International Support Network for African Development – Mentoring for Research Programme, Nigeria

Climate change adaptation, mitigation (CCA-M), and climate related disaster risk reduction (DRR) have more synergies than discords that needs harnessing. Municipalities are considered best equipped arms of governments globally to harmonize and mainstream these two parallel interventions into development practice but equally requires, harmonized legal, policy and other enablers to effectively achieve this goal.

Using summative content analysis and the exclusive use of secondary data, this paper reviews the extent to which the Zambian government in the global south has tried to undertake three major changes. a). to harmonise newly formulated legislation, policy frameworks and strategies post year 2015, that relate to CCA-M, DRR and decentralised municipality Integrated Development Plans (IDPs). b). to help streamline CCA-M and climate related DRR conceptually, and in practice. c). further promote the mainstreaming of these two harmonized concepts and practices into municipality development planning through the revised legal, policy frameworks and enablers.

There is little activity: to harmonise legislation at national level and policy frameworks that relate to CCA-M, DRR and municipality IDP; to encourage conceptual harmonization of CCA-M and DRR at practice level; to further encourage the mainstreaming of these two concepts in unison or as individual themes into municipality IDPs. There is however good political will and international donor support for the mainstreaming agenda in general for CCA-M as singular themes into the public sectors but not so much about harmonisation with DRR. There is need to scale up the legal, policy framework and enabler revision in Zambia and global south, in line with the global agenda 2030 and other related international / regional developmental frameworks.

Table 3: Sample of Legislation, Policy and enablers analyzed that relate to climate change adaptation and mitigation developmental work

Number of times a code, key words are mentioned in environmental related legislation, policy and other enabling frameworks and potential linkages between CCA-M, DRR and IDP

Environmental related legislation to support:Climate change adaptation-mitigation		(A1) CCA -M	(A2) DRR	(A3) IDP	(A4) CCA -M & DRR	(A5) CCA - M & IDP	(A6) DRR & IDP
Year	Legislation						
2019	Energy Regulations Act No. 12 [56]	0	0	0	0	0	0
2015	Forest Act No. 4 [57]	1	0	0	0	0	0
2015	Mine and Minerals Development Act No. 11 [58]	0	0	0	0	0	0
2015	Zambia Wildlife Act No. 14 [59]	0	0	0	0	0	0
2011	Environmental Management Act No. 12 [42]	1	1	0	0	0	0
2011	Water Resources Management Act No. 21 [60]	1	0	0	0	0	0
2011	Fisheries Act No. 22 [61]	0	0	0	0	0	0
	Subtotal code mentions	*2*	*1*	*0*	*0*	*0*	*0*
	Policies						
2016	National Policy on Climate Change [43]	15	5	5	5	5	0
2020	Zambia Climate Change Learning Strategy [62]	36	14	11	14	11	0
2019	Health National Adaptation Plan to Climate Change [63]	53	9	1	9	1	0
2014	National Forestry Policy [64]	10	0	5	0	5	0
2014	Second National Agriculture Policy [65]	10	0	0	0	0	0
	Subtotal code mentions	*124*	*28*	*22*	*28*	*22*	*0*
	Other relevant documents and enablers						
2018	Strengthening Climate Resilience of Agricultural Livelihoods in Agro-Ecological Regions I and II in Zambia (1 Mar 2018 - 12 Oct 2025) [66]	5	0	0	0	0	0
2018	Zambia Renewable Energy Financing Framework [67]	10	0	0	0	0	0
2017	National Investment Plan to Reduce Deforestation and Forest Degradation (2018-2022) [68]	19	1	3	1	0	0
2017	Building the resilience of local communities in Zambia through the introduction of Ecosystem based Adaptation (EbA) into priority ecosystems, including wetlands and forests [69]	60	0	2	0	2	0
2015	Intended Nationally Determined Contribution [70]	36	1	4	1	4	0
2015	National Strategy for Reducing Emissions from Deforestation and Forest Degradation (REDD+) [71]	25	0	2	0	2	0
2015	Zambia Second National Biodiversity Strategy and Action Plan (NBSAP-2), 2015-2025 [72]	8	0	6	0	6	0
2013	Technology needs assessment [73]	152	3	1	3	1	0
	Subtotal for the codes	*315*	*5*	*18*	*5*	*15*	*0*
	Grand total	*431*	*34*	*35*	*33*	*32*	*1*

The values 0 to X are the number of document sections containing codes of each field, which are classified according to the following categories: (A1) CCA-M Extract includes CCA-M codes; (A2) DRR Extract includes DRR codes; (A3) IDP Extract includes IDP codes; (A4) CCA-M & DRR Extract includes codes that show links between CCA-M and DRR; (A5) CCA-M & IDP Extract includes codes that show links between CCA-M and IDP; (A6) DRR & IDP Extract includes codes that show links between DRR and IDP

Biography

Dr. Bowen Banda is an environmental scientist based in Zambia, Southern Africa. He has a doctorate degree in environmental science with disaster risk science combination. His research interest are in the interface between conservation, sustainable development, climate change science, disaster risk science and urban & regional planning. He currently works in climate justice with the World Wide Fund for Nature in Zambia as Climate Adaptation Specialist and Advisor. Prior to this, he worked in a quasi government organization in conservation and livelihoods security, and then with United Nations World Food Programme and other internationally donor, supported projects by OCHA, UNHCR, World Bank, USAID, EU, Sida, Norad, Grand Challenges Canada, DFID, WVI Australia Support Office. He noticed that it was easier to work at provincial, national and international level but difficult at district level. Hence his new research interests in climate change and disaster risk reduction at local government level.

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Soil respiration in the sacred groves of Manipur, North-East India

Chongtham Sanjita and **Th. Binoy Singh**
Department of Life Sciences Manipur University, India

About 10% 0f 2700 GT of C in the soil is respired to the atmosphere. It may increase with higher temperatures to a certain extent because of microbial action. Small scale changes in the soil respiration rate might have feedback on the carbon sequestration potential of the soil and indirectly on the biomass. It is also highlighted that abiotic factors are the drivers of the seasonality trend of soil respiration. In this study, an automatic chamber of Q- box was used to measure the spatial and temporal variation of soil respiration in different sacred groves of Manipur which lie at low latitude. They have been preserving for a long time back, conserving forests, woodland, or other environmental and social structure. Considering the ecological role of the sacred grove, they can be considered as a mesocosm to study the soil carbon emission. In the present investigation, There was an increase in the CO2 efflux rate of the soil from moist summer to rainy season (April to August) to a maximum of 728.70 ± 19.06 to 950.97 ± 41.15 μmol m−2 min−1 and varied significantly ($F(5, 1722) = 2.92$ at $P > 0.05$). However, maximum percentage of variability was contributed by soil temperature ($r= 0.92$ at $P>0.01$) surpassing soil moisture and other abiotic factors responsible for the seasonality trend of soil respiration rate. Interestingly, it was observed that the litter biomass had negative correlation (-0.84) at $P>0.005$) with the soil C emission. Therefore, forest floors will remain intact and carbon from the decomposition of the biomass and litter might be sequestered in the soil layers. Further studies on temperature sensibility and rate-limiting factors of soil respiration in subtropical forest ecosystems are encouraged to enhance our understanding of the source-sink mechanism.

Biography

Dr. Chongtham Sanjita from Manipur University, Imphal, India. I have a passion for researching ecological findings and ecosystem services. I have expertise in the field of plant biodiversity in local and regional climate, nutrient cycle, carbon sequestration, litter dynamics and soil study of the region. Currently, I am in the process of visualising the ecological concept and research findings related to the ecosystem services in digital mode in favour of the students of the remote areas pursuing degree courses apart from imparting knowledge.

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Characterization of dredged sediments of Bouhanifia dam, Algeria, for the potential use in road construction

I. Abidi[1] and **L. Benamara**[2]

[1,2]*Laboratory of Rheology, Transport and Treatment of the Complex Fluids, Department of hydraulics, Faculty of Architecture and Civil Engineering, University of Science and Technology, Algeria*

Dam silting has become a common problem due to the deleterious aspects that it generates, such as reducing both water quality (during turbid hydrodynamic events) and storage capacity of the reservoir. Various approaches of dam desilting have been undertaken to deal with this issue; however, the problem is far from being solved due to millions of cubic metres of sediments that are being trapped and not bypassing towards downstream, which results in coastal erosion increment. This is particularly the case of the Bouhanifa dam in Algeria. So far, several geotechnical studies have been carried out aiming at evaluating this problem. The main objective of the current research study is the characterization of the dredged sediments of this dam for potential use as raw material to be harnessed for the construction industry. The valorisation of the dam dredged sediments might include the mechanical stabilization in road construction, which reduces the excavation of natural qualified materials. The feasibility of using different fractions (5%, 10%, and 20%) of Bouhanifa dam dredged sediments as an admixture to the calcareous tuff which is a natural material usually applied in roads construction in Algeria is studied herein. A rough prediction of the long-term mechanical behaviour of the sediments and tuf is reported based on their physical, chemical, and mineralogical characteristics and short-term mechanical performance tests. The current study suggests the feasible use of tuff admixed sediments as embankment or subgrade materials; however, the long-term mechanical behaviour investigation of these materials is essential, and their mechanical stabilization is recommended to enhance their geomechanical behaviour as it is expected from the sediments to present lower strength when compared with the tuff.

Biography

Ms Imene Abidi is a PhD student at the University of Sciences and technology of Oran Mohamed Boudiaf (USTOMB) in Algeria and at the University of Sapienza in Italy, her research interests focus on hydraulics, environmental engineering, geotechnical and structural engineering.

Ms Abidi has participated in several exchange programs such as Erasmus + exchange mobility at the University of Padova in Italy during her master studies, the University of Coimbra in Portugal and the University of Sapienza in Italy during her PhD studies. In addition, Imene has been a part of other prestigious educational programs, such as the Algerian Model United Nations (AMUN) and the first Algerian National Seminar about Eco-Materials and the Conception of Eco-structures (SNEMCES'21).

Imene has published her first scientific paper about the potential use of dam dredged sediments in the civil engineering field, specifically for the construction of roads.

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Interocurrence times and seismic hazard for upper-crustal volcanic chain earthquakes in El Salvador: Are they poissonian distributed?

Walter Salazar
Catholic University of El Salvador, UNICAES, El Salvador

We study the statistical properties of time intervals between successive earthquakes for a given magnitude in the El Salvador volcanic chain, namely hereafter the interoccurrence

times employing both the cumulative Poisson and the Weibull probability distributions.

The dataset comprises magnitudes between M 4.0 and 6.93 within the years 1528–2018.

We suggest that ITs pose the Weibull distribution for all events and that the Poisson distribution co-exists for ITs longer than the Weibull mean. Based on the probabilities distribution fit, we compute for engineering purposes ground motion and elastic response spectra for 5% damping employing time-dependent and independent seismic hazard models at San Salvador city, observing covariance of less than 7% amongst the models. The disaggregation analysis suggests that a magnitude 6.3 contributes most to the hazard and coincides with the magnitude bin of 6.25–6.50, which has the maximum conditional probability in the time-dependent model (after Salazar, W. 2021).

Biography

Dr. Walter Salazar is a structural civil engineer who obtain a doctoral degree in Engineering Seismology from the Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Japan, in 2004. Dr. Salazar has been active in site-effects and seismic hazard research, producing several peer-reviewed maps for El Salvador, Jamaica, and the Eastern Caribbean. He has published sixty articles in peer-reviewed journals, books, and international conferences. In 2011, he received a Distinguished Salvadoran National Award. He is a peer reviewer for several scientific journals. Dr. Salazar is a Professor of Structural Engineering at the Catholic University of El Salvador.

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The electric vehicle and renewable energy: Changes in boundary conditions that enhance business model innovations

Evaldo Costa[1], Petter Wells[2], Liqiao Wang[3] and Gustavo Costa[4]

[1]Institute, Instituto Universitario de Lisboa (ISCTE-IUL), Centro de Estudos Sobre a Mudanca Socioeconomica e o Territorio, Portugal
[2,3]Cardiff Business School, UK
[4]Gustavo Costa, Military Engineering Institute (IME), Brazil

Business model innovation consists of new ways of defining, creating, and capturing value including non-monetary value, and is an indicator of crossing traditional sector boundaries, thereby providing the necessary agency to achieve significant new market opportunities around technological innovation. Individual businesses may lack the scope or depth of competencies required, especially in the case of entrenched industrial structures, framings, regulatory provision, and consumer attitudes. Business models are thus potentially ossified within highly structured socio-technical systems. This article analyses innovation in business models arising from the confluence of two mature and stable industries under conditions of external pressure, deregulation, privatization, and the emergence of a new, shared interest. We illustrate the paper with examples of vehicle manufacturers developing business concepts for vehicle-to-grid, domestic energy, second life, and industrial electricity provision from renewable energy. We find that in the period 2012 to 2020, 17 vehicle manufacturers used 38 electric models to test a diverse menu of options established from four applications with changes in boundary conditions that have influenced business model innovation. This process created space for energy policy and mobility policy to become increasingly intertwined as battery electric vehicles enter the mass market, raising questions over the future of automobility as well as electricity generation and distribution.

Biography

Evaldo Costa is an interdisciplinary researcher. He has experience in Environmental Sciences and Environmental Engineering. His background includes a Ph.D. in Climate Change and Sustainable Development Policies from NOVA University of Lisbon, Portugal, and a Ph.D. in Business Economics at Vrije Universiteit Brussel, Brussels, Belgium. His research focuses on sustainable transition pathways. He has been exploring various theories and mobilized a wide range of methods and techniques, and tools covering quantitative, qualitative studies. He has relevant international experience in research; publishing articles in top/peer-reviewed journals; experiencing presentations at international conferences. He has acted as a reviewer for top/indexed journals, become a member of a Ph.D. supervisory board, and keeps a wide and active international relationship network. Before shifting his career to the research field, he worked several years as a university professor, and as an international industry consultant. He hopes contributing to a more sustainable and a better world.

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An innovative method to assess oxidative stress induced by particulate matter using a plant model organism

L. Massimi, E. Vaccarella, D. Piacentini, G. Falasca and **S. Canepari**

Department of Environmental Biology, Sapienza University of Rome, Italy

It is now recognized that one of the main mechanisms by which particulate matter (PM) exerts its adverse health effects is the generation of oxidative stress. Therefore, several acellular assays, which can be performed quickly and at a relatively low cost, have been developed to measure the oxidative potential (OP) of PM. However, these assays cannot represent the complexity of a biological organism and cannot provide complete information on the toxicological potential of PM. The use of model organisms could provide more detailed information about the ability of PM to generate oxidative stress in living organisms. This study is aimed to develop and optimize a simple, rapid, and low-cost method to study the oxidative stress induced by PM exposure using the plant model organism Arabidopsis thaliana. Plantlets of A. thaliana were exposed to certified urban dust (NIST1648a) and to the dust detached from PM samples collected in Rome and in the Po Valley (Italy) and analysed for oxidative potential by applying the AA, DCFH and DTT acellular assays, and for organic and elemental carbon, ions, levoglucosan, macro- and micro-elements. Oxidative stress was evaluated in the exposed plantlets by quantifying the production of superoxide anion ($O_2^{-\bullet}$) using the NBT assay which is based on the highly specific reaction that occurs between NBT and $O_2^{-\bullet}$, which leads to the formation of a blue-violet precipitate named formazan measured by UV-Vis spectrophotometer. The results obtained confirmed the reliability of DTT assay in predicting ROS generation in biological organisms and the suitability of A. thaliana as model organism for bio-indicator studies on PM effects on living organisms. Through the application of this method, it is possible to obtain information on the ability of PM to generate oxidative stress in living organisms quickly and keeping costs relatively low.

Biography

Lorenzo Massimi, PhD in Environmental and Evolutionary Biology, is currently Researcher and Professor of Environmental Chemistry (CHIM/12) and of Botany and Plant Diversity (BIO/01) at the Department of Environmental Biology of Sapienza University of Rome.

He has a consolidated experience in elemental analysis of complex environmental matrices and in sampling, processing and chemical characterization of environmental, biological and food samples.

In 2016 he carried out research activities at the GTS of Autonomous University of Barcelona, in 2018 he was a Visiting Researcher at IRAS of Utrecht University, in 2020 he was a Post-doc Researcher in Analytical Chemistry (CHIM/01) at the Department of Chemistry of Sapienza University of Rome. In 2020, he was also a Visiting Professor at the Department of Chemistry of University of Chile. In 2021, he was Post-doc Researcher in Environmental Chemistry (CHIM/12) at the Department of Environmental Biology of Sapienza University of Rome.

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Strong deep focus earthquake on August 19, 2018 (Mw=8.2) west of Tonga Islands

Alexander Lutikov
Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, Russia
Federal Research Center—Geophysical Survey, Russian Academy of Sciences, Russia

One of the strongest deep earthquakes on August 19, 2018, MW = 8.2, h = 600 km, near the Tonga Islands is considered. Its feature is the presence of a powerful aftershock sequence, which is generally uncharacteristic of deep earthquakes and allows us to consider it as a unique seismic event. Based on the first day aftershocks, its three-dimensional geometric model of the source was obtained, the seismic history and features of the aftershock process were studied. It is shown that the source of the earthquake on August 18, 2018 belongs to the NDC type. The duration of the aftershock process and the value of the scalar seismic moment released in aftershocks were estimated. Some characteristics of the August 19, 2018 earthquake were compared with those of the strong deep Sea of Okhotsk earthquake of May 24, 2013, MW = 8.3 off the western coast of Kamchatka. The main results of the work can be summarized as follows.

1. It is shown that the source of the strong deep earthquake of August 19, 2018, MW = 8.2 near the Tonga Islands has a shape close to isometric with upper estimates of its dimensions in the directions of 155 km (N–S), 126 km (E–W), 130 km (z). Similar estimates of the shape and size of the source were also obtained for the deep Sea of Okhotsk earthquake on May 24, 2013, MW = 8.3. At the same time, judging by the aftershock fields of the first day, the linear dimensions of the sources of these earthquakes are approximately two times smaller than the linear dimensions of crustal earthquakes with the same magnitudes.
2. The focal mechanisms of the earthquakes of August 19, 2018, MW = 8.2, h = 600 km and the earthquake in the Sea of Okhotsk of May 24, 2013, MW = 8.3, h = 611 km are guaranteed belong to the NDC-type sources; the source of the earthquake of 2018 off Tonga islands can be classified as a normal fault which characterizes the conditions of uniaxial extension. At the same time, the source of the Sea of Okhotsk earthquake of 2013 belongs to the thrust type and characterizes the conditions of uniaxial compression.
3. The consideration of the available seismic history in the presumed preparation region of the deep earthquake of August 19, 2018, MW = 8.2 near the Tonga Islands showed that its preparation period probably noticeably exceeds 100 years.
4. The duration of the aftershock process can be estimated at about 8 months, and the value of the scalar seismic moment released in aftershocks was estimated as M0 ≈ 9.85·1019 N·m that is of about 3.9% of the Main Shock's scalar seismic moment. The aftershock process of the earthquake in the Sea of Okhotsk of May 24, 2013, MW = 8.3, is estimated to have lasted for about 10.5 months, which is comparable to the duration of the aftershock process of the Tonga Islands earthquake.

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Consumer perceptions of greenwashing: Lessons learned from the fashion sector in the UAE

Sufia Munir and **Vivek Mohan**
Westford University College, Westford Education Group, UAE

This paper was published in the Asian Journal of Business Ethics on 11th January 2022 and underlined the relevance of the impact of greenwashing on the fashion sector in the United Arab Emirates. The practice of 'greenwashing' may be characterized as the fabrication of green claims by organizations to portray a positive image. Greenwashing has not been examined in the United Arab Emirates, and the fashion sector is considered the second-largest consumer of harmful chemicals, excessive water use, and non-compliant waste management practices behind the oil and gas sector. Using in-depth semi-structured interviews with fast fashion consumers in the UAE, an exploratory qualitative inquiry was conducted with a focus on the 'seven sins of greenwashing' and 'competitive altruism' theories and the consumer perceptions of green claims made by major apparel manufacturing and retail firms in the UAE were investigated. A conceptual framework was developed to better understand the nature of corporate altruistic behaviour and the perceived advantages of green initiatives. The exploratory qualitative inquiry used for this study provided a great opportunity for gathering detailed information on consumer perceptions of greenwashing practices in the UAE. Future research and statistical representation are needed to cross-reference the data and test the framework suggested here.

Biography

Sufia is a passionate educator and researcher with over 15 years of industry and academic experience. She has developed and delivered several sustainability management and fashion design courses. In the fashion industry, she has worked with notable brands such as Gap, Ralph Lauren, Banana Republic and Marks & Spencer. She holds a bachelor's degree in Fashion Design from Bangalore University (India), an MBA from Murdoch University (Australia), Certification in Retail Operations from TAFE, NSW (Australia) and completed the Leadership & Management Development Program from UCLA.

She is currently pursuing a PhD in Management from the University of Salford (UK) and her doctoral dissertation examines the adaptability of sustainable retail models in the fashion industry. She also serves as a reviewer for peer-reviewed journals, including the International Journal of Retail & Distribution Management, the International Journal of Sustainability Management and Information Technologies, and the American Journal of Art & Design.

Virtual Event

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Algorithm and data model foranalysis of data to enhance online learning using graph mining techniques

M Munshi
Ujjain Polytechnic College, India

Nowadays, the online education advancement has maximized after the COVID pandemic. Hence, improving the facilities and response is much important task in the digital applications. So, several neural models have been implemented alone and in combined hybrid version. However, those approaches have increased the computation cost and complexity because of the vast unstructured data. In addition, the unstructured data contains much amount of noise features that has made difficulties during the data analysis process. Also, if too many data are entered as the same time, then data overloading has been recorded during the grade analyzing process.

ENAM Preprocessing Students data Database Average Bad Good Performance Prediction Feature Analysis Fig.1 Proposed architecture Hence, the data overloading is the main cause of several issues like transmission delay, high resource usage and malicious events vulnerability. These issues have motivated this research toward on implementing the intelligent Apriori model. Hence, the present study has aimed to develop a novel Elman Neural with Apriori Mining (ENAM) to enhance the online education system by increasing the rapidity score on analyzing the student performance. Initially, the data has been pre- processed and entered to the classification module then the feature extraction and classification process has been performed. Finally, based on the present grade in the trained datasets, the student's performance has been noted. Subsequently, the parameters of the designed model have been validated and compared with other models, the proposed architecture is described in fig.1. In addition, the model Apriori Mining has afforded the student's performance results based on the priority of the grade submissions. This helps to avoid the data overloading and security threat. The performance parameter that has considered in this research work is Recall, F-measure, Precision, error rate and accuracy. Hence, by implementing the ENAM model in the online education system, the communication and data analysis process became enhanced with rapid accurate validation.

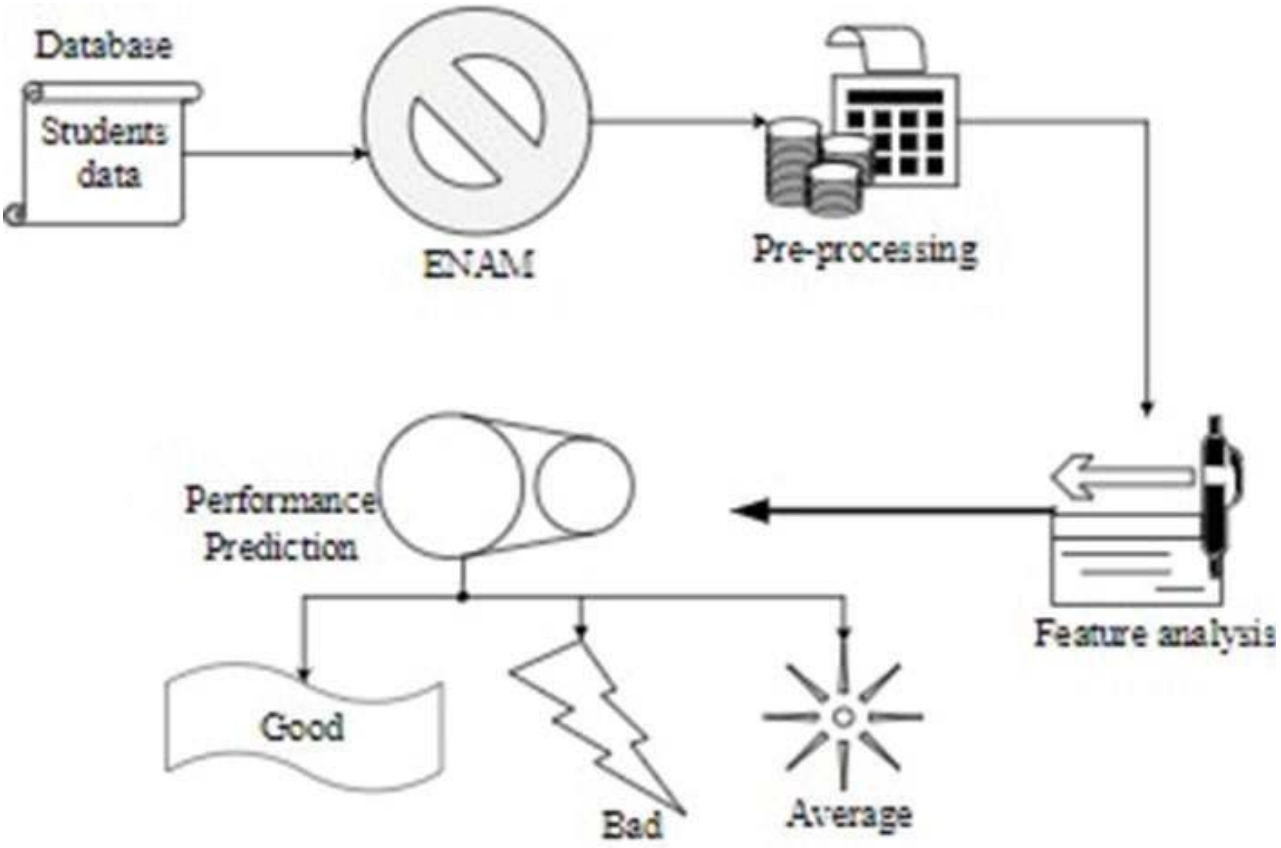

Fig.1 Proposed architecture

Biography

Working as Head of Department Government Polytechnic Ujjain India. Doctorate in Learning Analytics a renowned academician having more than 20 years of teaching, administration, industry, and research experience. Expert in Online Learning and Online examination, E Governance. Member board of studies RGPV and virtual IT cadre MP government. Having publications in national and international journals. Academic expertise in data science computer science and engineering, online learning, research methodology and physics.

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Why are some countries cleaner than others? New evidence from macroeconomic governance

Halil İbrahim Gündüz[2], Taner Akan[1], Tara Vanlı[1], Ahmet Baran Zeren[1], Ali Haydar Işık[1,3] and Tamerlan Mashadihasanli[1]

[1,2]*Istanbul University, Turkey*
[3]*Canakkale Onsekiz Mart University, Turkey*

This study aims to investigate why some countries are cleaner than the others with reference to macroeconomic governance (MEG) in order to explain how major macroeconomic aggregates should be governed to mitigate environmental pollution at the level of economic systems. Using per capita carbon dioxide emissions (CPC) as the proxy for air pollution, and macro-non-financial governance (MNFG) and macro-financial governance (MFG) as the proxies for MEG, the study introduces the systemic and fragmented governance of green complementarities (GCMs) and dirty complementarities (DCMs) as analytic concepts to compare the MEG models for managing pollution in 13 high-income countries (HICs), 10 upper-middle-income countries (UMICs), and nine lower-middle-income countries (LMICs) for the period 1994–2014. The paper has two major points in selecting an econometric technique for the estimation of the pollution–macroeconomy nexus. The first is to estimate the long-run and short-run causal relationships between pollution and macroeconomic governance. The second point is to make a holistic analysis of the pollution–macroeconomy, as noted above. The econometric technique to cover the two points noted above is panel data cointegration that estimates, first, the long-run and short-run relationships, and second, in a multivariate setting. The paper concludes that (i) HICs reduced their CPC levels thanks to adopting green systemic governance by creating GCMs between both MNFG and MFG variables in the long run; (ii) UMICs experienced a remarkable increase in their CPC levels due to adopting dirty systemic governance by creating DCMs between the MNFG variables, but prevented pollution from being higher through creating GCMs between the MFG variables; and (iii) LMICs experienced the highest comparative increase in CPC due to adopting a fragmented governance in managing both MNFG–pollution and MFG–pollution nexus.

Biography

Halil İbrahim Gündüz have been working as a Senior Research Stuff in the Department of Econometrics at Istanbul University Faculty of Economics for more than 10 years. His primary research areas are on statistical analysis of time series data, requiring techniques in the interface between econometrics, statistics and data science.

Research Interests:

- Quantification of model uncertainty, using bootstrap, analysis of high-dimensional "Big Data" time series, long-run trends in macroeconomic, energy and climatological time series, risk measures for financial series, and the forecasting of macroeconomic and financial time series.

Awards:

- Turkish Economic Institution PhD Thesis Research Award Competition, Spring 2021. [Research awards competition given to PhD thesis competition in economics and related fields.]
- Foundation for Economic Research MS. Thesis Competition Awards}, Spring 2014. [Research awards competition given to MS. thesis competition in economics and related fields.]

Technology and multimodality in teaching pre-service teachers: Fulfilling diverse learners' needs

H. Almumen
College of Education, Kuwait University, Kuwait

The purpose of this study was to explore the impact of the use of multimodality during college level instruction. Using quantitative and qualitative methods, data were analyzed to determine the effectiveness of incorporating multimodality in teaching pre-service teachers. Results indicated the use of multimodality increased participants' knowledge and awareness of Special Education concepts and strategies for teaching students with disabilities. Results also indicated there was a significant difference in knowledge gained by the experimental group when compared to the control group.

Biography

Huda Almumen is an Assistant Professor of Special Education at College of Education, Kuwait University. After her seven years of experience as a middle school teacher of English as a Second Language, Huda pursued her graduate studies, gaining her Master's from College of Education, and her doctorate from University at Buffalo, State University of New York. Dr. Almumen's research interest and expertise focus on the use of technology in teaching students with disabilities. She also has interests in future teacher preparation programs for educating and including students with Special Needs. Her goals are to help individuals with exceptionalities gain better learning opportunities, specifically with enrolling the technological tools. She is also interested in preparing future teachers on how to use these tools to enhance their teaching endeavors for all students including those with Special Needs.

Virtual Event

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Circular economy as one solution for a future sustainable European iron and steel industry

J. Rieger[1], V. Colla[2], E. Malfa[3], D. Snaet[4] and K. Peters[4]

[1]K1-MET GmbH, Austria
[2]Scuola Superiore Sant'Anna, Italy
[3]Tenova S.p.A., Castellanza, Italy
[4]European Steel Technology Platform AISBL, Belgium

The steel industry is an important engine for sustainable growth, added value, and high-quality employment within the European Union. It is committed to reduce its CO2 emissions from production up to 50% by 2030 compared to 1990's level ultimately reaching climate neutrality by 2050. This should be reached by developing and upscaling technologies required to contribute to European initiatives, such as the Circular Economy Action Plan (CEAP) and the European Green Deal (EGD). The Clean Steel Partnership (CSP, public private partnership), led by the European Steel Association (EUROFER) and the European Steel Technology Platform (ESTEP), defines technological CO2 mitigation pathways. A roadmap (Strategic Research and Innovation Agenda) has been developed, which details the pathways comprising Carbon Direct Avoidance (CDA), covering technologies to avoid emitting carbon during steelmaking, Smart Carbon Usage (SCU) meaning the ways to use the carbon from steel production for other applications, via carbon capture, utilization, and storage (CCUS) and process integration (PI), and Circular Economy (CE). The CE approaches ensure competitiveness through increased resource efficiency and sustainability. It also consists of different issues, such as the valorization of steelmaking residues (dusts, slags, sludges) for internal recycling in the steelmaking process, enhanced steel recycling (scrap use), the use of secondary carbon carriers from non-steel sectors as a reducing agent and energy source in the steelmaking process chain, and CE business models (supply chain analyses). The current presentation gives an overview of the different technological CE approaches focusing on future challenges towards the final goal of an industrial deployment.

Biography

Johannes Rieger from the Austrian metallurgical competence center K1-MET is responsible for the research areas Raw Materials & Recycling and Metallurgical Processes. These research fields focus on characterization and utilization of raw materials and residues from iron and steel industry and on process development (converter, continuous casting, electro slag remelting, copper refining). He holds a PhD in Process Technology (focus on industrial environmental Protection) from the Montanuniversitaet Leoben (Austria). He is also an active member within the ESTEP Focus Group Circular Economy.

Virtual Event

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Life cycle approach for the eco-design of wooden products

F. Thiebat[1] and **I. Bianco**[2]

[1]*Department of Architecture and Design, Politecnico di Torino, Italy*
[2]*Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino, Italy*

The European furniture sector is dynamic and competitive, currently facing a transition to further increase the environmental sustainability and circularity of its products. Literature on this topic is relatively abundant and authors converge in the identification of the main sustainability criteria. Nevertheless, defining which sustainability criteria should be prioritised is still open to question. This is due to the high number of variables in the life cycle of furniture and also the specific characteristics of each piece of furniture. In this context, a Life Cycle Assessment (LCA)-based tool has been developed. It considers the main materials and processes typically used in the furniture sector. The tool is provided both as a model to be imported in an LCA software (for use by LCA-experts) and as a spreadsheet document (for use by non LCA-experts or for quick analyses). Both of these versions of the tool contain editable parameters that allow the model to be adapted to specific pieces of furniture. In addition, both versions have been tested using the case study of a wooden armchair conceived and produced by an Italian architectural and design firm. The tool has made it possible to quantify the environmental impacts of the armchair and the evaluation of four possible scenarios to enhance its environmental sustainability.

This work can therefore guide the actors in furniture value chains as to the choice of the criteria able to maximise the furniture sustainability throughout its life cycle.

Biography

Francesca Thiébat, Associate Professor and Architect. She studied architecture at the Politecnico di Torino and the Bartlett School of architecture and planning in London. She holds a Phd in architectural Technology from Politecnico di Torino. She coordinates and collaborates on research projects in the following areas: sustainable design; services for the community (healthcare, elderly, schools, public space); sustainability evaluation methods (performance-based design, bioclimatic design, nearly Zero Energy Building, Life Cycle Assessment); product innovation and circular economy.

She is Program Director of Architecture for Sustainability Master of Science at the Politecnico di Torino where she teaches Architectural Technology and Environmental Design.

She is Editor Assistant of the Journal of Technology for Architecture and Environment TECHNE.

Her research works has been presented at international conferences such as SETAC, DIRE, IPBC, PLEA and published in national and international journals and monographs.

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Hydraulic fracturing electromagnetic monitoring: Dynamic modeling, electrical anisotropy scenarios and its relation to microseismic

A. Curcio[1,2]
[1]*Proingeo SA, Argentina*
[2]*SEG Director-at-Large, Argentina*

While the energy transition is real and active, the hydrocarbon sector will continue to be major energy sources for the foreseeable future. In consequence, to reduce risks in hydraulic fracturing operations and to study its interaction with geology, it is very important to monitor the evolution of the fracking.

It was developed a simulation of the electromagnetic (EM) response and its joint interpretation with microseismic monitoring simulation during hydraulic fracturing in an unconventional reservoir. A multiphysics workflow is presented, using a criterion based on a breakdown pressure to generate and propagate the fracking and its associated pressure, saturation, electric field, magnetic field, electrical current and electrical resistivity maps. A second step of this study comprises the simulation of the EM response to different electrical anisotropic scenarios and transmitter to receiver configurations.

The results indicate: first, the EM response might be sensitive enough to be monitored and the magnetic field correlates better with the saturation distribution than the electric field, yielding additional information to determine the stimulated reservoir volume. Second, in an anisotropic resistive scenario, the magnetic field is the most sensitive field when discriminating different types of anisotropy for all receiver positions; in both stratified and fractured medium the vertical electric field have higher total amplitudes inside the layer whereas the magnetic field in the top and inside it, and the horizontal electric field does in the top and above it; independently of the symmetry, the horizontal electric field is one order of magnitude higher than the vertical electric field above the anisotropic layer and this relation changes inside the layer. Finally, in a horizontal well hydraulically fractured, the relative percent difference of the vertical electric field is higher than the other fields, but this relation can change when moving to other geometries.

Biography

Ana Curcio simultaneously earned her degrees in physics from the faculty of exact and natural sciences; engineering and MS in geodetic-geophysical engineering from the faculty of engineering and a PhD, summa cum laude, at Buenos Aires University. Also, she is Oil and Gas production specialist (ITBA).

With 15 years experienced in the energy sector, Ana specialized in multiphysics for complex geophysical exploratory problems in hydrocarbons and lithium industries, covering the entire scope of the technology spectrum. Currently she is advisor in both industries.

Ana worked for Schlumberger, Pan American Energy, Petrobras, Litica Resources and others. She developed skills on seismic interpretation (Onshore, offshore and deep targets); microseismic and anisotropy (unconventional reservoirs); in electromagnetics, she reached leadership level and is proficient in supervising a field crew operationally and technically as well as in data processing, interpretation and multiphysics integration.

Curcio is SEG (Society of Exploration Geophysicists) Director-at-Large. She previously took leadership roles in SEG committees, SEG Council and Annual meeting Global Co-Chair.

Ana is Treasurer in the Argentinean Association of Petroleum Geologists and Geophysicists and IAGA division VI committee member.

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Map groundwater-dependent ecosystem in semi-arid environments

Iongel Duran-Llacer[1], José LuisArumí[2], Loretto Arriagada[2], Mauricio Aguayo[3], Octavio Rojas[3], Lisdelys González-Rodríguez[3], Lien Rodríguez-López[4], Rebeca Martínez-Retureta[2], Ricardo Oyarzún[5] and **Sudhir Kumar Singhghor[6]**

[1]Hémera Centro de Observación de la Tierra, Escuela de Agronomía, Facultad de Ciencias, Universidad Mayor, Chile
[2]Centro de Recursos Hídricos para la Agricultura y la Minería (CRHIAM), Universidad de Concepcion, Chile
[3]Facultad de Ciencias Ambientales y Centro EULA-Chile, Universidad de Concepcion, Chile
[4]Facultad de Ingeniería y Tecnología, Universidad San Sebastian, Chile
[5]Departamento Ingeniería de Minas, Universidad de La Serena, Chile
[6]K. Banerjee Centre of Atmospheric and Ocean Studies, University of Allahabad, India

Groundwater (GW) use has intensified in recent decades, threatening the ecological integrity of groundwater-dependent ecosystems (GDEs). The study of GDEs is limited; therefore, integrated, interdisciplinary environmental approaches that guarantee their monitoring and management amid current climate and anthropogenic changes are needed. A new geospatial method with an integrated and temporal approach was developed through a multicriteria approximation, taking into account expert opinion, remote sensing-GIS, and fieldwork to map groundwater-dependent ecosystem zones (GDEZ). A survey of experts (N = 26) was conducted to assign degrees of importance to the various geospatial parameters, and the mapping was carried out using 14 parameters. The reclassified parameters were normalized on a scale of 1 to 5 according to the degree of probability of the presence of GDE. The validation was carried out through fieldwork and statistical analysis. Then, the spatio-temporal changes amid changing GW levels were assessed using the summer season normalized difference vegetation index (NDVI). Two GDEZ maps were obtained, for 2002 and 2017, between which the high- and very-high-probability zones of GDEs decreased by 31,887 ha (~ 38%). The most sensitive temporal parameters that most influenced the spatio-temporal changes on GDEs were precipitation and land use, with rain exerting a slightly the greatest influence. It was also demonstrated that identified ecosystems decreased in area or were affected by aquifer depletion (NDVI-GW, r Pearson ≥0.74). This validated method allows spatio-temporal changes in GDEs to be mapped and analysed at an annual scale and is transferable to other arid and semi-arid environments.

Biography

I graduated with Honors from the University of Havana as a Bachelor of Geography (2013). Then, I was a collaborating researcher at the Institute of Meteorology and worked as a professor of Meteorology-Climatology, and Tropical Meteorology at the Faculty of Geography, University of Havana (2017). I obtained my PhD. in Environmental Sciences with a mention in Continental Aquatic Systems at the University of Concepción, Chile (2021). My research focus is in Physical and Environmental Geography, using Remote Sensing and GIS. I am currently a Postdoctoral Researcher at the Hemera Earth Observation Center of the Universidad Mayor of Santiago, Chile.

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Shuffling evolution, the biosphere gene pool and their role in the evolution of the biosphere

G.Mikhailovsky
Global Mind Share, USA

Symbiogenesis involves horizontal gene transfer (HGT) as one of its main drivers. Due to the double chain character of HGT, genes with an adaptive mutation spread very rapidly among existing species, creating new ones. This causes these genes to spread faster than they are destroyed. As a result, they become practically immortal, forming a "biospheric gene pool" (BGP). Not each of these genes exists in every species, and certainly not all of them are expressed. The vast majority of genes in BGP are repressed by regulatory genes. However, they are often expressed and subjected to natural selection. This mechanism for testing repressed genes for adaptability can be thought of as "shuffling a deck of genes" by analogy with shuffling a deck of cards. Before the Phanerozoic eon, both BGP and the operational part of each genome were quite poor. Accordingly, biological evolution during these eons was slow due to the extreme rarity of adaptive mutations. However, over these approximately 3.5 billion years, BGP gradually accumulated a huge number of genes. We believe that multicellular eukaryotes that appeared at the end of the Proterozoic eon, could, with the help of HGT, shuffled these genes accumulated in BGP through prokaryotes living in these multicellular organisms. Perhaps this was the reason for the "Cambrian explosion" and the high (and increasing) rate of evolution in the Phanerozoic eon compared to the previous ones. Modern anthropogenic modification of the biosphere refers to the Cambrian explosion as a real explosion to the combustion process. But the Cambrian explosion led to the complication of the biosphere, while the anthropogenic "superexplosion", on the contrary, to its simplification. The shuffling evolution continues at an increasing pace. But whether he can compensate for a man-made super explosion is a big question

Biography

I began my career at Moscow State University, where I received my Ph.D. in biophysics in 1969. I then moved into oceanography and ecology, taking part in more than 20 biological science cruises and a dozen Arctic coastal expeditions. I have worked extensively on multidimensional statistical models of plankton communities and wrote computer programs to implement them. In 1983, I got my doctorate in systems ecology. In 1995 I moved to the USA and for the last 20 years I have worked as a principal systems analyst in a private company CALIBRE. Simultaneously, I continue my research in the field of evolution and became the editor-in-chief of the Journal Evolutionary Science. In 2013, Gary Sorrell and I founded the non-profit organization Global Mind Share, of which I am still president. I have published 5 books and about 90 articles in scientific journals and chapters in scientific monographs.

SCIENTIFIC ABSTRACTS

DAY 2

PEERS ALLEY MEDIA

Virtual Event

Global Summit on Advances in Earth Science and Climate Change

September 15-16, 2022

Virtual Event

Global Summit on
Advances in Earth Science and Climate Change

Comparative landslide spatial research based on various sample sizes and ratios in Penang Island, Malaysia

P. S. Fam[1], H. Gao[1], L.T. Tay[2] and H. C. Low[3]

[1]School of Mathematical Sciences, Universiti Sains Malaysia, Malaysia
[2]School of Electrical and Electronic Engineering, Universiti Sians Malaysia, Malaysia
[3]Research and Innovation Unit, Universiti Sains Malaysia, Malaysia

This paper aims to compare and develop the influence on different sample sizes and sample ratios when using machine learning (ML) models, i.e., support vector machine (SVM) and artificial neural network (ANN), to produce landslide susceptibility maps (LSMs) in Penang Island, Malaysia. At the same time, traditional statistical (TS) models are also considered to produce LSMs in this comparative research. The receiver operating characteristic (ROC) curve and recall metric are applied to evaluate the model's performance. Based on the evaluation criteria, the ML model outperforms the TS models and the ML models trained using the datasets with larger sample size give a better performance. ML models, especially SVM models, have better performance when training with balanced datasets as well as the datasets of more landslide sample data. Kruskal-Wallis test and Mann-Whitney U test are applied to test the significance. The results indicate that sample size and sample ratio are essential factors when considering ML models to produce LSMs. The LSMs produced in this research can provide valid and useful information to the local authorities for landslide mitigation and prediction.

Biography

Dr. Fam Pei Shan is a Senior Lecturer at the School of Mathematical Sciences, Universiti Sains Malaysia. Currently, she is Program Chairperson of the Bachelor of Applied Science (Applied Statistics) in the school. She obtained her Bachelor, Master and Ph.D. degree in Statistics from University of Malaya, Malaysia. Her research interests include categorical data analysis, regression analysis and reliability analysis. She is Editorial Board Member of Journal of Statistical modelling & Analytics (JOSMA). She is active in landslide prediction study. She has authored several journal articles on slope failure analysis.

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Achieving sustainability in food manufacturing operations and their supply chains: Key insights from a systematic literature review

David Adams, Jerome Donovan and **Cheree Topple**

Swinburne University of Technology, Australia

Managing sustainability in the food supply chain is critical given the very large environmental and social footprint that the food industry has globally. The food industry and its associated agricultural supply chain accounts for around 29 percent of global greenhouse gas emissions, 80 percent of deforestation and 70 percent of freshwater use. Food industry players have become increasingly involved in these issues due to stakeholder pressures, and this highlights the importance in understanding what sustainability practices and best practices are being utilised. A review was undertaken that identified the current state of knowledge of how food manufacturing companies implement sustainability in their operations and across their supply chains. A thematic analysis was conducted on 130 papers that were published over a 21-year time frame from 1999 to 2020 to identify eight key sustainability themes in the literature. These themes included – life cycle assessments, drivers, barriers and incentives to sustainability, waste and recycling management, food chain logistics, sustainability practices in small and medium sized enterprises, supplier management, partnerships and relationships and "other" sustainable supply chain management practices. Through examining the literature, it is clear that there remains substantial scope for research on the role of small and medium sized enterprises and food logistics. It is also clear that large multinational companies have a critical role in supporting supply chain practices through driving practices and also in providing critical resources for partners across the supply chain. The circular economy is emerging as a key research area that is experiencing increasing focus, although it is argued that future research should focus on digitisation efforts such as through Internet of Things and blockchain that has been highlighted as a major disruptive and supportive element in increasing sustainability across supply chains. This work should be of interest to academics, practitioners, and policy makers in their pursuit of sustainability objectives.

Biography

David Adams is a food technology graduate with 40 years' experience in the food industry, primarily in research and development and also quality. He have an MBA from Monash University in Australia and he have held senior management positions with a number of multi-national food companies. He have lived and worked in Australia, China, Singapore, and England. For the last 15 years of his food industry career, he was Director of Quality for the Asia Pacific region for Kraft Food Limited which involved a considerable amount of travel throughout the region and increased his interest in food industry sustainability. This position also involved leading the regions crisis management team. He is now two years into a full-time PhD at Swinburne University of Technology in Australia focusing on sustainability in the food and beverage industry.

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Explorative study of aquaponics systems in Indonesia

Nurhayati Br Tarigan[1], Simon Goddek[1] and Karel J. Keesman[1]

Wageningen University & Research, Netherlands

Aquaponics is the combined cultivation of fish in aquaculture systems and plants in hydroponic systems (HPS). This study aimed to explore and evaluate new aquaponics system designs in Jakarta, Indonesia, in terms of water and nutrient efficiency, and/or profitability. The systems are combination of recirculated aquaculture system, HPS, duckweed cultivation system, and anaerobic digester units. The latter converted settled material from RAS to biogas and waste sludge. In total, one brackish water (BW) system with barramundi-tomato and three freshwater (FW) systems with Nile tilapia-rice-duckweed, Nile tilapia-rice, and Nile tilapia-tomato were investigated using dynamic mathematical models using mass balance. State variables included are fish biomass, feed, plant biomass, phosphorus, NH4+, and NO3-. The results showed an increase of N, P, and water use efficiency by 10%, 18%, and 31%, respectively, in FW system of Nile tilapia-rice compare to Nile tilapia-tomato. Meanwhile, adding duckweed in the Nile tilapia-rice FW system only contribute a slight increase of nutrient and water the efficiency while worsened the already negative net present value (NPV) of the system due to the high land prices in Jakarta. The BW system had similar water and nutrient efficiency to FW system of Nile tilapia-tomato, but a lower NPV. Profit of the Barramundi-tomato and Nile tilapia-tomato becomes comparable if the hydroponic area in the former system can be expanded by 35%, or the selling price of tomato or fish can be increased by 20%. Given the expected growth of both the production of tomatoes and aquaculture in Indonesia, there is potential for further introduction of aquaponics systems in Indonesia.

Biography

Nurhayati Br Tarigan is a PhD candidate at Wageningen University and Research (WUR), the Netherlands. She finished her MSc in Biosystem Engineering, WUR and BSc in Bioengineering, Institut Teknologi Bandung (ITB), Indonesia. She is passionate to develop sustainable agriculture in Indonesia through knowledge transfer with local farmer. Her current PhD project is about nutrient and water quality management of pond aquaculture in Indonesia, with a goal to create smart farming avoid overfeeding. Before her study in the Netherlands, she was a research assistant in ITB, conducted researches to valorize agricultural waste in West Java, Indonesia and converted it to high protein biomass.

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Modular-mini refineries: A positive strategy for developing economies

Himmat Singh
Ex Scientist 'G' CSIR- Indian Institute of Petroleum, India

Modular-Mini refineries are scaled-down versions of standard oil refineries. They vary from simple diesel production units to more sophisticated ones, are less cost intensive. These can be used more flexibly to respond to changes in product demand, particularly in developing economies with reasonable to rich oil resources. Key drivers of Modular refinery market are:

- Rise in government initiatives to increase local refining capacities by investing significantly in modular refineries, primarily based on local crude supplies to convert it into ever increasing demand for refined products, to reduce fiscal deficit, ensure security of transportation fuels, enhance power generation and secure LPG supply, quick installation period and lower investment costs. In addition such plants offer great environmental friendliness as compared to standard plants.
- Country specific reasons: Nigeria says the gap between petroleum product demand and supply in the country is due to the sub-optimum state of their domestic refineries. Indonesia, an archipelagic country, faces challenges in supplying fuel to various remote regions. Solution evolved is to build mini refineries with appropriate processing capacities to maximize the potential of existing oil reserves, reach remote areas and meet domestic demand.

The Modular-Mini refineries tend to be topping or hydro-skimming type that may range from 5,000 to 30,000 BPSD crude capacity. Configuration tends to be simpler and can include process units such as a Crude Distillation Unit, Diesel Hydro-treating, Naphtha Hydro-treating, Reforming, Isomerization, Sulfur treating, etc. Such refineries can be configured and sized to meet target product demands and flexible to expand for future needs. Other benefits include: high quality off site modular fabrication, shorter schedule and possibility for future relocation.

Mini refining has been embraced as a positive strategy in developing economies with Nigeria and Indonesia being the lead nations. Also Emirates National Oil Co' plans to build a 7,500 bpd modular refinery in Fujairah, Iran plans eight new mini-refineries to serve the South Pars gas field, Equatorial Guinea and Angola refinery projects.

Biography

Dr Himmat Singh served as Scientist 'G' at the CSIR–Indian Institute of Petroleum, Dehradun, in the area of Petroleum Refining. Post retirement, worked as Advisor R&D for three years with BPCL, Mumbai. Total experience in applied research & development 39 years. Post retirement alsoserved for 15+ years as Professor and Head of Department of petroleum /Chemistry at Three Indian universities. Visiting Faculty in premier Institutes/Industry of India and abroad to teach downstream petroleum & Natural Gas professionals and MBA students.

Dr Singh holds: MSc in Chemistry, Diplome D'Ingenieur in "Rafinage et Petrochemie" from ENSPM of IFP France, and a Doctorate in Chemistry-Refining of Lube Base Stocks from Meerut University, India. He has published a total of 200+ papers, 67+ in foreign journals, supervised 10 Ph.D thesis. He is recipient of many prestigious awards. Currently he function as a consultant in the field of petroleum Refining & natural gas.

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Assessment of water resource management problem in an agriculture field, Purulia, India using multi-criteria decision making (MCDM) based on possibility measures under generalized single valued non-linear bipolar neutrosophic environment

Totan Garai[1], George Biswas[2], Uttaran Santra[3] and Suryadipta Mukherjee[2]

[1]Department of Mathematics, Syamsundar College, India
[2]Depetment of Geology, Presidency University, India
[3]Central Mine Planning & Design Institute Limited, Coal India Limited, India

Purulia district in West Bengal, India, is a well-known drought-prone area. Farmers of the area suffer a lot the whole year and could not plant the crops due to the poor water resources management. During the summer season, the situation becomes worst. Water resource management (WRM) is a potential method to address the available water resources for the district. In this paper, we have developed a multi-criterion water resource management technique for defining available water resources in agriculture. We have introduced a novel ranking method of generalized single-valued non-linear bipolar neutrosophic numbers based on possibility measures. Additionally, we have first defined the possibilistic mean of generalized single-valued non-linear bipolar neutrosophic number. Using the possibilistic mean, we have invented the positive and negative rank expositor for authenticity, hesitate, and falsity membership functions. In the present situation, water resource management in agriculture has become a big problem worldwide. Multi-criteria decision-making (MCDM) technique is necessary for developing this situation. Using the proposed multi-criteria decision-making (MCDM) method, we have solved a real water resource management problem in the Purulia district under GSVnTbN-environment. In this decision-making problem, we have considered the GSVnTbN-environment. Because during the summertime, water demand is very high, and groundwater level declines. At the end of summer, water demand is deficient in the agriculture field of the Purulia district. Sometimes the monsoon season, rainwater does not occur entirely. Even rainfall is uneven over the district. At that time, monsoon crop planting was tough in the agriculture field. So, this district's water scarcity nature is of a non-linear and uncertain type of nature. Therefore, we proposed an MCDM method for water resource management problems under GSVnTbN-environment.

Biography

Dr. Totan Garai received his post-graduation (M.Sc) in Mathematics from the Indian Institute of Technology, Madras, and Ph.D. in Mathematics from the Indian Institute of Engineering Science and Technology, Shibpur. Currently, he is working as an Assistant Professor in the Department of Mathematics, Syamsundar College, West Bengal -713424, India. He has qualified CSIR-UGC National Eligibility Test (NET). He has been teaching Mathematics both at the undergraduate and postgraduate levels. His research areas are Possibility theory, Fuzzy optimization, Inventory model, and Decision-making problem. He has authored more than 20 papers (over 14 are SCI) published in refereed International Journals, including Computational and Applied Mathematics, International Journal of Intelligent Systems, Expert systems and application, Journal of Intelligent & Fuzzy Systems, Soft Computing, Journal of Ambient Intelligence and Humanized Computing, Mathematics & Statistics, Journal of Industrial and Production Engineering, Granular Computing, The Journal of Analysis, Annals of Data Science, Journal of Uncertainty Analysis and Applications, CAAI Transactions on Intelligence Technology, etc. His Google citations are more than 200. He reviewed many national and international journal articles.

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Use of partial molal enthalpy for refining the partition of water activity into electrostatic and nonelectrostatic components

Jyoti Sahu
Department of Chemical Engineering, National Institute of Technology, India

This paper describes a procedure to precisely decouple the electrostatic and the nonelectrostatic contributions to the water activity of an electrolyte solution, using the partial molal enthalpy of water in the electrolyte solution. This work is an extension of our previous work [Sahu et al. in Fluid Phase Equil. 460:57–68, 2018, Data in Brief 19:485–494, 2018], where a methodology to segregate the electrostatic and non-electrostatic contributions to the water activity was discussed and the constancy of the electrostatic contribution to the water activity was shown. However, in this paper, it is a noticeable point that even a 2% variation in the electrostatic contribution to the water activity leads to a very large deviation in the electrostatic contributions to the partial molal enthalpy of water. Therefore, due to the high sensitivity of the enthalpy to the variation of the water activity, the partial molal enthalpy of water is used for refinement of the method of partitioning the water activity into electrostatic and nonelectrostatic contributions and to provide the physical interpretation of the electrostatic and nonelectrostatic contribution to the partial molal enthalpy of water. This paper also describes the procedure to estimate the partial molal enthalpy of water from the water activity of the electrolyte solution. Microcalorimetry has been used to estimate the closed-spaced points of partial molal enthalpies.

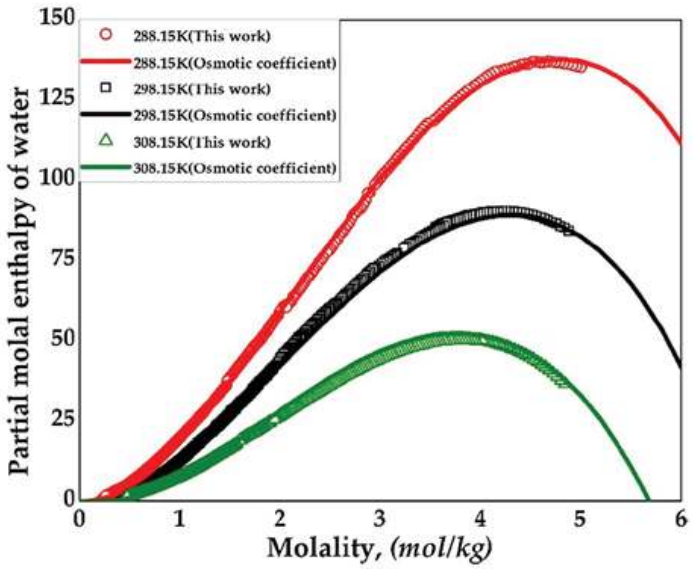

Figure: Plots of partial molal enthalpies (J•mol−1) of water of aqueous NaCl solution

Biography

Dr. Jyoti Sahu has earned his M.Tech.-PhD dual degree from Indian Institute of Technology, Bombay in Chemical Engineering with thermodynamics in electrochemistry in 2018. Prior to this, she has hold B.Tech.– Chemical Engineering from H.B.T.I. Kanpur, India. Following the completion of her Ph.D., she had done her postdoctoral from IIT Delhi, and IIT Kanpur.

Her Ph.D. work is focused on the thermodynamic analysis of electrolytic systems with both experimental and theoretical components. Based on her research work, she has numerous publications and monographs in various renowned journals. Apart from this, she has various international conference proceedings papers also as a first author.

Presently, Dr. Jyoti Sahu is working as an Assistant professor in the Department of Chemical Engineering in N.I.T. Tiruchirappalli, Tamil Nadu. Recently, she has been awarded "Best Young Woman Faculty Award 2021 - 2022" by Novel Research Academy. She has also been selected for InSc Young Researcher Award-2021.

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Optimization of bio crude production from co-liquefaction of organic solid waste with fecal sludge and peat for an integrated waste to energy approach

S.B. Kabir
Presidency University, Bangladesh

Globally, approximately 600-700 million tons/yr. of solid waste and 250-300 million tons/yr. of fecal sludge (FS) are not managed in an environmentally safe manner which is a major concern for global warming and climate change. Another environmental concern for global warming is wetlands that globally emit approximately 5 % of total greenhouse gases through organic biomass decomposition. To mitigate these environmental impacts, this study explored the waste-to-energy approach through a thermochemical conversion named hydrothermal liquefaction (HTL). While HTL has been extensively investigated for wet-feedstock valorization, less attention has been paid to enhancing the lighter fraction and heating value improvement. This study optimized the co-HTL process mechanism of organic solid waste (OSW) with Fecal sludge (FS) and peat at different mixing ratios (1:0, 1:3, 1:1, 3:1, and 0:1) and temperature variations (280 to 340 °C) for enhancing lighter biocrude production. The synergistic effect was observed during co-liquefaction of OSW with FS and peat for a mixing ratio of 3:1 at 320°C. The maximum biocrude yield of 51 - 52% was observed for co-liquefaction, of which 60 - 64 % was lighter-fraction. The light biocrude contained 45 - 60 % ester, 12 - 18 % organic acids, and 12 - 26 % fuel hydrocarbon fractions with a small amount of phenol, heterocyclic compounds, and amine derivatives. The findings demonstrated that the decarboxylation, deamination, and esterification mechanism was enhanced during co-liquefaction. The ester-hydrocarbon-rich biocrude exhibited a heating value of 37.4 - 42.7 MJ/kg, suggesting that the produced biocrude would be a potential alternative to fossil fuel (gasoline ~ 43.4 MJ/kg). This energetically feasible process would provide a revenue stream of $ 467 - 568 per metric ton of feedstock, validating the high economic prospects of the waste to energy approach.

Biography

Sadib Bin Kabir is a Lecturer at the School of Engineering, Presidency University, Bangladesh. He had worked as a research assistant on Waste to Energy project for three years in the Department of Civil Engineering, Khulna University of Engineering & Technology, Bangladesh. His research interests include global warming and climate change mitigation, anaerobic wastewater treatment, biohythane production, hydrothermal liquefaction, biological pretreatment processes, and transesterification of waste feedstocks. He invests in the development of individuals and build up a strong team spirit about engineering and research by regularly taking engineering, project management, and leadership courses. Recently, he worked on two conversion processes i.e., the co-hydrothermal liquefaction and the anaerobic digestion process of waste to biofuel conversion and published one review paper in Biotechnology Advances, eight Scopus indexed journal articles as well as six international conference proceedings. He is currently looking for opportunities to study Doctor of philosophy in renewable energy.

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Impact of climate change adaptation on food security in Ethiopia

Diptimayee Nayak[2] and **Taye Tesfaye Fishia**[1]
[1]*Indian Institute of Technology Roorkee, Uttarakhand, India & Dilla University, Ethiopia*
[2]*Indian Institute of Technology Roorkee, India*

This study identifies different climate change adaptation strategies implemented by farm households and evaluates the effect of these adaptation strategies on the food security of these households in the Gedeo zone, SNNPR, Ethiopia, by using cross-sectional data from 400 sample farm households. It aims to analyse the impact adaptation of climate change adaptation strategies on food consumption and food security. We have used the endogenous switching regression model supported by propensity score matching methods to evaluate the impact of adopting climate change adaptation strategies on food consumption calorie intake, and binary food security status. Secondary data is also obtained from Gedeo zone agricultural offices and the national metrology agency.

Results show that socioeconomic, demographic, and biophysical factors like age of the household head, marital status, farm income, non-agricultural income, landholding size, climate change information access, credit access, fertility of the soil, and agro-ecology are the major determinants of farm household's decision to adopt adaptation strategies. The average food consumption calorie intake is higher for the adopter compared to the non-adopter.

The impact of adoption is slightly higher for the non-adopter than the adopter farm households. Thus, policies and development plans that encourage the adoption of climate change adaptation strategies should focus on improving the food security status of farm households in the study area.

Biography

Dr. Diptimayee Nayak is currently works as an assistant professor of economics at Indian Institute of Technology Roorkee, India. Dr. Diptimayee's main research areas of expertise are environmental economics, ecological economics, biodiversity, conservation, protected area, valuation of ecosystem services and sustainability.

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Klebsiella oxytoca; An efficient pyrene-degrading bacterial strain isolated from petroleum contaminated soil

Mushtaq Ahmad Mir[1], Abdulkhaleg M. Alfaify[2] and **Sulaiman A. Alrumman[2]**

[1]Department of Biology, College of Science, King Khalid University, Saudi Arabia
[2]Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, King Khalid University, Saudi Arabia

Polycyclic aromatic hydrocarbons (PAHs) are the hazardous xenobiotic agents of oil production. One of the methods to eliminate hazardous compounds is bioremediation, which is the most efficient and cost-effective method to eliminate the harmful byproducts of crude petroleum processing. We isolated five pure bacterial isolates from petroleum-contaminated soil, four of which showed a robust growth on the PAH pyrene, as a sole carbon source. Various methods, viz, mass spectroscopy, biochemical assays, and 16S RNA sequencing ascertained the consistent identification of Klebsiella oxytoca. Scanning electron microscopy and Gram staining further demonstrated the characterization of the K. oxytoca. High-performance liquid chromatography of the culture supernatant of K. oxytoca grown in pyrene containing media showed that the cells started utilizing pyrene from the 6th day onwards and by the 12th day of growth 70% of the pyrene was completely degraded. A genome search for the genes predicted to be involved in pyrene degradation using Kyoto Encyclopedia of Genes and Genomes (KEGG) confirmed their presence in the genome of K. oxytoca. These results suggest that K. oxytoca would be a suitable candidate for removing soil aromatic hydrocarbons. In future, genes involved in pyrene mineralization and the pathways involved in its metabolism would be identified.

Biography

Dr. Mir earned his PhD from the Indian Institute of Science (IISc), Bangalore, India. After acquiring knowledge and gaining interest in understanding the biology of human pathogen Mycobacterium tuberculosis, Dr. Mir moved to Harvard Medical School, Boston, USA, and investigated the signaling mechanisms of environmental queues by the same pathogen. Dr. Mir subsequently moved to Wadsworth Center of New York State Department of Health, NY, USA, to further pursue the translation mechanism of leaderless RNAs of mycobacterium. Presently Dr. Mir is an Assistant Professor at the College of Applied Medicine, King Khalid University, Saudi Arabia, where beyond teaching, he is involved in identifying the novel natural compounds having antibacterial activity against the drug-resistant/sensitive bacterial strains and subsequently investigating the underlying molecular mechanisms for such activity. Dr. Mir extended his interest in environmental sciences, especially in bioremediation.

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Removal of persistent chemical oxygen demand from pharmaceutical wastewater by Ozonation at different pH

Gome A. and **Upadhyay, K.**
Chemical Engineering Department, Ujjain Engineering College, India

Ozonation has been applied to treat actual pharmaceutical wastewater sample for the removal of chemical oxygen demand. Ozonation can generally achieve higher pharmaceuticals removal rates as compared to conventional processes as ozone reacts with variety of complex compounds, intermediates and breaks them into simpler ones. Chemical oxygen demand removal study can be useful to elucidate the effect of pH on ozonation. In this study, an attempt has been made to assess impact of ozonation on the removal of persistent chemical oxygen demand from actual pharmaceutical wastewater sample under varying conditions of pH from 4-10. Lower chemical oxygen demand removal efficiency was observed under acidic medium (pH 4.0) as compared to those at pH 6.9 and 10.0. Treatment at alkaline pH 10.0 using 30.0 mg L-1 ozone for a treatment time of 10 minutes resulted in 66.67% chemical oxygen demand removal from the sample. It was reported that ozonation at higher pH favored chemical oxygen demand removal from the sample. At elevated pH, indirect reactions are main means of ozonation and also as the rate of formation of hydroxyl radicals substantially increases, it can be said that the percentage chemical oxygen demand removal was significant in alkaline medium. Improved biodegradability (ratio of biochemical oxygen demand to chemical oxygen demand = 0.455) after 10 min of treatment showed the effect of ozonation on actual sample. It was concluded that ozone treatment alone can remove pharmaceuticals from actual wastewater sample.

Biography

Dr. Ashish Gome, born on December 15, 1979 at Ujjain

- **Education:** Bachelor of Engg (Chemical Engg, 2000), Master of Technology (Chemical Engg, specialization-Environmental Management, 2005) from Govt. Engg College, Ujjain and Doctor of Philosophy (Ph.D. Chemical Engg, 2016) from Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal (M.P.), India. Qualified GATE (examination conducted by IITs) with an All India Rank of 719.
- **Experience:** 14 years
- Served in Govt. Polytechnic College, Govt. Engg College, Ujjain as Guest Faculty, Contract Faculty at Vikram University, Ujjain and Asso. Prof. at SGSITS, Ujjain (M.P.). I worked as a Head of Department, Dean (Admin) and Training & Placement Officer.
- **Present:** Working as an Environmental Consultant at AM Ozonics Pvt. Ltd., Mumbai (Maharashtra) for 6 years.
- **Scholastic Achievement:** Secured All India Rank 8 in REEPG-2001, an examination conducted by the University of Roorkee (Now an IIT) for admissions M.Tech.
- **Research Interest:** Water and Wastewater treatment (advanced oxidation)

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Climate change, growth in agriculture value added, food availability and economic growth nexus in the Gambia: A granger causality and ARDL modelling approach

Momodou Mustapha Fanneh[1], Ebrima K. Ceesay[1], Phillips C. Francis[2], Sama Jawneh[1], Matarr Njie[1] and **Christopher Belford[1]**

[1]University of The Gambia, Gambia
[2]West African Science Service Center for Climate Change and Adapted Land Use, Cheikh Anta Diop University of Dakar (UCAD), Senegal

This paper aims to test empirically, the direction of causality between climate change, agriculture valued added, Food production (the proxy for food availability), and economic growth in the Gambia. This study employed annual data which were collected for the period 1960–2017 and analyzed these data using the ARDL approach and the granger causality framework. The empirical evidence shows that: (1) the short-run and long-run ARDL model confirmed that the growth of fish production and growth of livestock production in the Gambia have significant positive impacts on the growth of GDP; (2) the short-run and long-run ARDL model indicated that growth of food import and growth of agriculture have negative impacts on the growth of GDP; (3) Granger causality analysis between the lagged values of growth of GDP and lagged values of growth of Food availability indicators has unidirectional relationships; (4) lagged values of the growth of GDP Granger cause lagged values of growth of agriculture but lagged values of growth of agriculture does not Granger cause lagged values of growth of GDP, which suggested an indirect relationship; (5) the relationship between the lagged values of growth of crop production and lagged values of growth of agriculture indicated a bidirectional relationship. Finally, an important indication is established on the role of fish production, livestock production, climate change, and crop production to control food availability and economic growth in the Gambia.

Biography

Assoc. Prof Momodou Mustapha Fanneh obtained a Doctorate degree in Economics at Fordham University, New York, an MBA at Rutgers State University of New Jersey, USA and MSc. in Economics University of Southampton, UK. He was an Adjunct professor at Rutgers, State University of New Jersey and Lehman College, New York.

Currently, Dean of School of Business and Public Administration, University of The Gambia, a Senior Research Associate at Center for Policy Research and Strategic Studies (CepRass) and a Senior Researcher at Directorate of Research and Consultancy, University of the Gambia with more than 20 years of research experience. His main research interests are international trade, development economics, macroeconomics and monetary economics.

He worked as a Senior Transport Planner/Economist at the Department of State for Works, Communications and Information, The Gambia, 1996 – 2000 and involved in the development of National Transport Plan and National Transport Policy of The Gambia.

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Investigating feasibility of interlayers in resistance spot welding of low-carbon steel sheets

Vishesh Dharaiya

Doctoral Research Fellow, Department of Mechanical Engineering, IITB-Monash Research Academy, India

In this study, experiments without interlayers and with interlayers of copper and stainless-steel sheets were performed.Design of Experiments based Full-Factorial Method was employed to generate experimental combinations. A total 81samples were welded and tested in Universal Testing Machine to determine their Breaking Load. To investigate feasibility considering vehicle lightweightness, a novel LTW (Load-to-Weight) ratio has been proposed. Calculated LTW ratio for each experiment clearly showed that samples with stainless-steel interlayer outperformed over samples with copper interlayerand samples without interlayer. For feasibility in terms of machine durability, electrode corrosion has been found as themost auspicious parameter among all. Spot welding electrodes attain air oxidation above 700 °C. An FEA solver has been employed to determine time for electrodes to remain above air oxidation temperature during a single welding cycle through numerical simulation. A novel LTT (Load-to- Time) ratio has been proposed to find experimental combinations considering feasibility regarding electrode corrosion. LTT ratio, applied to experimental combinations with SS interlayer helped in selection of suitable process parameter combinations. Selected combinations through LTW and LTT ratio can be further proposed to industries. Study advocates method to calculate LTW ratio initially, following calculation of LTT ratio and eventually selecting process parameters contemplating feasibility in lightweightness and electrode corrosion.

Biography

Vishesh Dharaiya is a doctoral researcher at IITB-Monash Research Academy (A joint PhD program between Indian Institute of Technology, Bombay and Monash University, Australia). He has his bachelors in mechanical engineering and masters in profduction engineering. His area of interest are conventional and non-conventional manufacturing. His goal is to use to make manufacturing processes more sustainable. He has published several research papers in reputed journals and conferences. He has two published patents.

On the long range dependence property of fractional counting processes

Kuldeep Kumar Kataria
Indian Institute of Technology, India

The fractional generalizations of the Poisson process has drawn the attention of many researchers since the last decade. Recent works on fractional extensions of the Poisson process, commonly known as the fractional Poisson processes, lead to some interesting connections between the areas of fractional calculus, stochastic subordination and renewal theory. The state probabilities of such processes are governed by the systems of fractional differential equations which display a slowly decreasing memory. It seems a characteristic feature of all real systems. Here, we discuss some recently introduced generalized counting processes and their fractional variants. Various fractional counting processes such as the fractional Poisson process and its mixed variants exhibit the longrange dependence property. It is proved by establishing an asymptotic result for the covariance of inverse stable subordinator.

Biography

Dr. Kuldeep Kumar Kataria received his BSc (Hons) degree in Mathematics from St. Stephen's College, University of Delhi. He received his MSc degree in Mathematics from IIT Kanpur. In 2018, he received his PhD in Mathematics from IIT Bombay. Later, he joined IISc, Bangalore as a NBHM Post-Doctoral Fellow. He is currently working as an Assistant Professor in the Department of Mathematics at IIT Bhilai. The research interest of Dr. Kataria lies in the area of fractional stochastic processes and subordinated (time-changed) versions of certain counting processes. He deals with stable subordinators and space-time fractional versions of the Poisson process. In his PhD thesis, he has studied the applications of Adomian Decomposition Method to certain fractional stochastic processes. So far, Dr. Kataria has published 19 research articles in international journals of repute like Journal of Theoretical Probability, ALEA. Latin American Journal of Probability and Mathematical Statistics, Journal of Mathematical Analysis and Applications, Comptes Rendus Math´ematique, Statistics and Probability Letters, Stochastic Analysis and Applications, etc. Also, he has published several expository articles in reputed mathematical magazine like American Mathematical Monthly, Mathematics Magazine, etc. For his research contributions he has been honoured with the Award of Excellence in Thesis Work for the year 2016- 2018 by Hon'ble Prime Minister of India at the 56th Convocation of the Institute (IIT Bombay).

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Climate change perception and local adaptation of natural resource management in a farming community of Cameroon: A case study

Pierre Marie Chimi[1,3], William Armand Mala[1], Jean Louis Fobane[5], François Manga Essouma[2,4], Jean Aimé Mbom II[1,3], Forbi Preasious Funwi[1] and Joseph Martin Bell[3]

[1,3,4,5]University of Yaounde, Cameroon
[2]Scientific Coordination for Perennial Crops - Regional Center for Agricultural Research of Nkolbisson, Institute of Agricultural Research for Development (IRAD), Cameroon

Climate change is perceived by communities at different levels and their adaptation measures are often corresponding to local understanding and realities. A socio-economic survey and field observations were conducted among 95 Bàkì farmers in the Ntui district of Central Cameroon, to examine the community's perception of the changes observed and the adaptation measures undertaken locally. Apart from the relative homogeneity of its community, the area was chosen for its climatic conditions. This area is characterized by a bimodal rainfall pattern on the one hand and by a transitional rainfall pattern between the bimodal patterns of the far south and the unimodal pattern of northern Cameroon. The study found that the Bàkì community has developed a classification of the climatic seasons through the changes observed over time, namely the increase in temperature, the decrease in rainfall, and the resurgence of extreme events such as their currency of violent winds and drought. The classification confirms the locally important changes in climate that affect the agricultural calendar, thereby planning the community's socio-economic activities. In response to the effects observed, the farmers have developed an adaptation strategy that includes reverting to more appropriate farming practices and more resistant varieties. Notably, the farmers use are adding a grid of climatic and environmental variations as are ference to decide on adaptive actions and adaptation measures. The study results reconfirm that perception of climate change is strongly influenced by age and education.

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Importance of identification of source zones in seismic hazard analysis

Abhishek Kumar and **Niranjan Borah**
Department of Civil Engineering, Indian Institute of Technology, India

Development of seismotectonic map of the study area is a first step while attempting seismic hazard analysis. It consists of finding past earthquakes within a defined seismotectonic province along with the information on seismic sources in the region. Information on past earthquakes can be gathered from various database and gives more or less a complete picture of known earthquakes within a user defined region. Information on seismic sources is very critical. It is primarily due to the fact that while the development of seismic sources is a continuous process depending upon the tectonic setting and governing dynamics of the region. However, studies targeting to identification of seismic sources in a region happens for specific purpose that too confined to specific regions. As a result, although information about past earthquake is available, knowledge of seismic sources responsible for generating such events is incomplete majority of times. This can be understood from the fact that numerous seismic hazard studies exist with earthquake events present in locations of no seismic source. Overcoming this limitation of partial knowledge of linear seismic sources, numerous studies attempted seismic hazard studies based on identification of zones/ aerial seismic sources. However, it has been observed that identification of such zones are mostly based on either visual identification or taking variation of parameters such as rupture characteristics, geology, topography etc. into account. In such case, whether the seismic activity in each identified zone is uniform or not is not checked. Present manuscript will present a broader overview of factors considered in identification of source zones for seismic hazard studies and their effect on the findings of such seismic hazard studies. Further, rational methods which are in practice in seismology to identify regions of uniform seismicity will be discussed in detail. Identification of appropriate source zones will also have effect of relative use of selected attenuation relations since the range of distance of each identified source zone from the site of interest will change. How this affect can be taken into account while determining relative weights of selected attenuation relations, will also be discuss in this manuscript.

Biography

Dr Abhishek Kumar is working as Associate Professor at the Department of Civil Engineering, Indian Institute of Technology Guwahati, India since Jan 2019. His primary research areas include seismic source characterization, ground response analysis, inverse ground response analysis, liquefaction assessment, ground improvement of liquefiable sites, development of regional ground motion prediction equations, geophysical exploration. Dr. Kumar has so far published 39 Journal papers, 40 Conference papers and 5 book chapters. He is closely working with different agencies such as Department of Science and Technology, Government of India, Ministry of Earth Sciences, Government of India, Numaligarh refinery limited etc. on various research and consultancy projects. His research findings on development of source characterization methodologies, development of regional GMPEs applicable for different site classes for North India and determination of dynamic soil response curve has received much attention in the recent times.

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Groundwater potential zoning by integrating multi-Criteria decision and bivariate analysis methods – A case study on cheyyar river basin, Tamil Nadu, India

Vishnuvardan Narayanamurthi and **Annadurai Ramasamy**
SRM Institute of Science and Technology, India

The study aims to improve the pairwise decision matrix of the widely used analytical hierarchy process (AHP) to generate groundwater potential zones for Cheyyar River Basin through multi-influencing factor (MIF) and bivariate analysis. MIF prioritizes 11 time-independent input thematic layers, and Cramer's V dependency value from bivariate analysis is used to assign the decision values of the pairwise matrix. The resulted potential zones are classified into four categories: Poor, Moderate, Good and Very-Good, with 15.33, 70.78, 13.88 and 0.002% of the total area. Well yield data from fourteen wells are used for validation, and the accuracy value is 85.67%. The conclusions arrived are as follow: (1) Utilizing the Cramer's V value for pairwise matrix enhanced the reliability of decision, (2) The spatial variation of potential is influenced majorly by the Lithology and (3) Annual average rainfall and groundwater fluctuation indicating the groundwater availability matches with the zones of groundwater potential.

Biography

Mr Vishnuvardan Narayanamurthi, full time research scholar in SRM institute of Science and Technology, Chennai, India completed Under Graduate degree in Civil Engineering from Anna University Chennai and Post Graduate degree in Hydrology and Water resources Engineering from Anna University Chennai. Also having academic teaching and research experience of 8 years. Presently working on Recharge efficiency of recharge zones based on numerical modelling.

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Process parameter optimization in the development of ecofriendly brakepads from waste Nko-nko (*thais coronata L.*) seashells using central composite design

E.O. Ekpruke[1], C.V. Ossia[2] and **A. Big-Alabo[2]**

[1]Africa Center of Excellence- Center for Oilfields Chemicals Research (ACE-CEFOR), University of Port Harcourt, Nigeria
[2]Applied Mechanics & Design (AMD) Group, Department of Mechanical Engineering, University of Port Harcourt, Nigeria

This study investigates the optimization of the process parameters in the development of ecofriendly automotive brakepads from agro-wastes of nko-nko (Thais Coronata L.) seashells (NSS) reinforcement materials using central composite faced-centered design (CCF). The brakepad composites was developed by compression moulding using seashells reinforcement, epoxy resin binder, CaCO3 filler, methyl-ethyl-ketone peroxide catalyst, carbon black friction modifier, iron filing abrasives and copper fillings thermal conductivity enhancer. Twenty samples of NSS brakepads were developed from 3-levels of 3 process parameters, namely; curing time, curing temperature and moulding pressure as independent variables. The physicomechanical and tribological properties of the samples were measured as dependent variables for the optimization. Response surface multivariate quadratic models, signal–to–noise ratio and ANOVA were employed in the optimization. The determined optimal process parameters for the developed NSS brakepads were 13MPa moulding pressure, 165□ curing temperature and 3h curing time. The measured properties of the developed samples were compared with those of two commercial (control) samples. EDX spectroscopy results showed the presence of toxic heavy metals (7-40% Sb, 6.44-12.88%Ti, traces of Se, Sn, Mo) in the commercial (control) samples unlike the NSS samples. The comparative analysis showed superior performance of the developed brakepads relative to the control samples.

Biography

Engr. E.O. Ekpruke is a doctoral student of Mechanical Engineering at the Africa Center of Excellence- Center for Oilfields Chemicals Research (ACE-CEFOR) and a Research Officer at the Applied Mechanics & Design (AMD) Research Group, Department of Mechanical Engineering, University of Port Harcourt. He has seven (7) published journal articles with several others currently under review. His research interest is in the area of nonlinear dynamics and materials engineering.

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Controls on biomarker and carbon isotope patterns during the Toarcian anoxic event (dormettingen section; swabian alb)

Stephen Ajuaba[1], Reinhard F. Sachsenhofer[1], Achim Bechtel[1], Francesca Galasso[2], Doris Gross[1], David Misch[1] and **Elke Schneebeli-Hermann[2]**

[1]Lehrstuhl Erdölgeologie, Montanuniversitaet Leoben, Austria
[2]Paläontologisches Institut und Museum, Universität Zürich, Switzerland

The Toarcian oceanic anoxic event (T-OAE) is associated with a prominent negative carbon isotope excursion (CIE;~183 million years (Myr)). About 10-m-thick organic matter-rich sediments accumulated during the T-OAE in the Southwest German Basin (SWGB). Rock– Eval, maceral and biomarker analysis were used to determine variations of environmental conditions across the CIE interval. Carbon isotope records were determined for various n- alkanes, pristane and phytane to contribute to the reconstruction of the paleo-environment and to study the factors controlling molecular δ13C values. Geochemical redox indicators provide evidence for photic zone anoxia during the Toarcian CIE, which reached its maximum after deposition of the "Unterer Stein" marker horizon. The 2α-methylhopane index suggests enhanced activity of diazotrophic cyanobacteria, which is also supported by nitrogen isotope data. This distinguishes the SWGB from other Toarcian basins with black shale deposition. Oxygen-depleted conditions, albeit with lower intensity continued after the CIE. All investigated organic compounds replicate the negative CIE, but the magnitudes vary considerably. The largest shift is observed for n-C27 (9‰) and reflects the combined effect of the global CIE and a major change in organic matter input (termination of terrigenous organic matter input). The shift for short-chain n-alkanes, pristane, and phytane, interpreted to reflect marine biomass, varies between 4.5 and 5.0‰. This is the highest value observed so far for any Toarcian section. δ13C values of pristane and phytane reach a minimum near the base of the CIE interval and increase upsection. Thus, the maximum negative isotope shift predates the strongest basin restriction by about 450 thousand years (kyr).

Biography

Stephen Ajuaba is currently a research associate and Ph.D. applicant from Cameroon and works on "Enhanced oil-source correlation using biomarkers and compound-specific isotopes". His work covers the application of various geochemical and petrographic techniques for the analysis of the molecular and isotopic composition of oil, natural gas and rock extracts, to enable accurate an efficient characterization and correlation of oils to their source rocks and also to reconstruct their paleo depositional environments. He currently works on the organic- rich Toarcian shales in SW Germany and the Permo-carboniferous rocks in Weiach, Switzerland. Previously, he gained work experience in sedimentary geology during his M.Sc. project in Italy and Spain (2018) and in organic geochemistry during his post-graduate traineeship (2019) at the Montanuniversitaet Leoben.

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Environmental decision criteria for partial nationalization of pharmaceutical supply chain

Patricia Véras Marrone, Maria Lídia Dias Scoton, Sérgio Luiz Pereira and **Eduardo Mario Dias**
University of Sao Paulo, Brazil

Background: Any disturbance affecting the Pharmaceutical Supply Chain (PSC) can affect the efficiency of the health system and disrupt the supply of medicines. The global pharma supply chain has been facing shortages in the supply of pharmaceuticals. Due to PSC shortages, many countries adopted actions to mitigate the risks of disruptions. Many recommendations have been proposed, such as adopting a plus one diversification approach, increasing safety stock, and nationalizing the medical supply chains.

Objective: The objective of this paper is to scope findings, advanced in the academic literature related to criteria to be elected to guide national policy decisions regarding the partial nationalization of the pharmaceutical supply chain under the three main stakeholders' points of view: Industry; payers (government and health insurance) and patients.

Definition: A criterion can be defined as an "individual measurable indicator" of a key value dimension (Department for Communities and Local Government, 2009) or more specifically, a "particular perspective" according to which alternative technologies may be compared (Belton and Stewart, 2002).

Results: A total of 10,501 titles were screened 984 entered the abstract screening. Of these, 400 were eligible for the full-text review, 120 were included in the final data extraction phase the articles related to the "Partial Nationalization of Pharmaceutical Supply Chain" were aggregated into three main perspectives: Industry Perspective; Payers' Perspective and, Patients' Perspective. After deduplication and clustering, 6 scopes and were identified and after the merging and selection process, a set of 16 general criteria was proposed. Environmental impact is one of the scopes/ points of view to be observed. Under this scope "Environmental risk caused by emissions and Waste generation during Level I upstream process" was chosen as a criterium.

Conclusion: Based on the results of the systematic and scoping literature review, a pool of 6 and their respective scopes of concepts were identified in the literature, under which 19 criteria were selected. The findings can serve as a starting point for constructing "Partial Nationalization of Pharmaceutical Supply Chain" frameworks after careful adaptation to the local context.

Biography

Patricia Véras Marrone: Partner-Director of Websetorial Economic Consulting, she is an economist who graduated from the University of São Paulo (1984), with a master's degree in Economic Sciences from the University of São Paulo (1992). She is currently undertaking a doctoral program in Electrical Engineering at the Polytechnic Institute of the University of São Paulo. She works chiefly in the following areas: microeconomics, and the development of analyses, strategies, and industrial policies for diverse segments of the economy. Is co-author of the books: "Automation and Society" (2017), "Health 4.0" (2015), and "The Laboratory Diagnostics White Book" (2021). DOI 0000-0001-5631-5587

D. Maria Lídia Dias Scoton: DOI 0000-0002-7651-3991

PHD. Eng. Sérgio Luiz Pereira: DOI 0000-0001-5210-7078

PHD. Eng. Eduardo Mario Dias: DOI 0000-0002-2104-1747

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Transforming undergraduate biology education with 5CC's teaching practices

Kyriaki Chatzikyriakidou
Florida International University, USA

The 5 core concepts (5CCs) of biology presented in Vision and Change provide a comprehensive, concept-based description of the knowledge of biology, summarized in five main biological scales and five overarching principles that dictate natural biological phenomena and processes. To bring the 5CC's in the biology classroom, we designed the 5CC's matrix table with five rows, each containing a core concept and three columns, containing the biological scales of molecular/cellular, organismal, and population/ecology, respectively.

We have developed a lesson plan that bridges the gap between student understanding of content knowledge and their ability to connect this knowledge to larger biological principles through the integration of Primary Scientific Literature (PSL) and the 5CCs. Through the use of a matrix table detailing each one of the 5CCs and their related organizational levels, students learn how to integrate PSL and the 5CCs by connecting biological facts contained within PSL to a related biological core concept.

Additionally, we have implemented the matrix table in typical introductory biology courses where students (n=77) provide short responses of how each of the 5CCs related to the given class topic (Aquaporins, Aerobic respiration, and DNA transcription). An inductive coding analysis of student responses was performed to reveal the main connections students made between each of the three topics and the 5CCs. Results showed that for some core concepts it was easier for students to draw connections to a simple topic, such as aquaporins, while for other core concepts it was easier to draw connections to a multistep phenomenon, such as aerobic respiration.

Although further researcher is needed, teaching practices that integrate the 5CC's seem promising and could advance student conceptual understanding and integration of biological knowledge.

Biography

Kyriaki Chatzikyriakidou has a PhD in Food Science and a Master's in Curriculum and Instruction by the University of Wisconsin – Madison. She has served as teaching instructor in various undergraduate biology courses for the past decade and her passion is to help students learn biology effortlessly. While teaching undergraduate students, Kyriaki realized the challenges freshmen had in learning scientific principles and the major reforms required in the current undergraduate teaching practices. Kyriaki's major research interest is the integration of the Five Core Concepts (5CC's) for biology in active learning practices, as a way to provide more effective teaching and help biology students improve their conceptual understanding of biology.

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Modeling storm water runoff: The strengths and weaknesses of current software

Jiayi Li and **Teresa Culver**
University of Virginia, USA

With climate change and urbanization, the world is faced with frequent flash floods, depletion of groundwater, and water pollution simultaneously. Stormwater Best Management Practices (BMPs) is an effective method to mitigate flash floods, purify stormwater, and recharge groundwater. To design successful BMPs, it is crucial to predict the BMPs' effectiveness in terms of both stormwater volume reduction and pollutant removal under current and future weather conditions. However, such a modeling tool is not yet available. In this work, we reviewed 14 currently available modeling tools designed for either agricultural fields or urban areas in the perspective of assisting stormwater simulations. Two publicly available models were applied to simulate two experimental bioretention systems. The results verify that no current models are successful in stormwater quality modeling. The current urban stormwater models are advanced at hydraulic calculations, but describe removal of all dissolved pollutants with first-order reaction kinetics, not influenced by environmental factors like temperature or soil moisture. This description is not accurate for nutrients which degrade through biochemical processes. On the contrary, agricultural models simulate nitrogen transformations in detail, while important hydraulic processes of surface run-on and drainage discharge are overlooked. Based on the review and case study, a process-based nitrogen module is developed as an extension of current urban stormwater models.

Biography

Jiayi, Li is a current PhD candidate in Environmental Engineering at University of Virginia. She has a passion in building smart water systems that turns stormwater from potential cause of flood risk into safe water resource, and faces the challenge of climate change. She has developed process-based nitrogen modules for stormwater BMPs that increased prediction accuracy of nitrogen removal rates by more than 20%. With these modules, she is currently developing real time control strategies for stormwater BMPs under 2050 and 2100 weather scenarios.

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Parameters associated with sexual precocity of nellore heifers in integrated systems

K. F. Bertogna[1] and **L. B. Lopes**[2]

[1]*Federal University of Mato Grosso, Brazil*

[2]*Embrapa Agrosilvopastoral, Brazil*

This study evaluated how integrated crop–livestock–forestry systems affected the expression of sexual traits in Nellore heifers. The serum concentration of insulin-like growth factor type-I (IGF-I), follicular diameter, rump fat thickness (RFT), and weight gain were assessed in 48 prepubertal Nellore heifers (14–16 months old, initial average live weight of 270 ± 36 kg). Calf birth weight was assessed after parturition. Heifers were distributed into four production systems following a completely randomized block design, with 12 animals in each treatment: open pasture (OP); two silvopastoral systems (SPSs—single rows or SPSt—triple rows), and crop-livestock system (CL). Thermal comfort was evaluated using the black globe, as well as humidity index (BGHI) and radiant thermal load (RTL). Animals in all treatments were exposed for long periods to heat stress; however, thermal indexes got lesser values in the SPS treatments. Heifers from the SPSt achieved the greatest serum concentration of IGF-I, but the follicular diameter did not differ among systems, as initially expected. The greatest weight gain and RFT standards were found in heifers of the CL system. Calves born from females of exclusive livestock (OP) showed the smallest weight at birth. Therefore, we suggested the adoption of the SPS and CL systems for livestock beef ranches as Nellore heifers reached better zootechnical and physiologic parameters associated with sexual precocity.

Biography

Kássila Fernanda Bertogna was born on May 3, 1994 in the city of Dourados, Mato Grosso do Sul. She grew up accompanying her family in activities in the agricultural sector in the state of Mato Grosso. In 2013, she began her degree in Veterinary Medicine at the Federal University of Mato Grosso – Campus Sinop, concluding in 2018. She was a volunteer professor in the same course and university of academic training, from 2018 to 2019. In March 2019, she started the Postgraduate Program -graduate degree in Animal Science also from the Federal University of Mato Grosso – Campus Sinop, with a line of research in animal production, submitting to the defense of the dissertation on February 24, 2021. Currently works with assistance in reproductive, health and nutritional management on farms of dairy cows.

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Gas sensing application of nanostructured metal Oxide semiconductor -Polypyrrole nanocomposites

Ajay Pratap Singh Gahlot[1,2], Ayushi Paliwal[2] and Avinashi Kapoor[1]

[1]Department of Electronic Science, University of Delhi South Campus, India
[2]Physics Department, Deshbandhu College University of Delhi, India

Aim of present work is design of gas sensing devices which are based on the nanocomposite of the two metal oxide semiconductors (ZnO and SnO2) and the Polypyrrole conducting polymer, using Surface Plasmon Resonance (SPR) Technique. Metal oxides are excellent choices as base materials in emerging technologies in the field of Gas Sensors. Gas sensing response characteristics of the prepared sensor were performed. Optical technique is preferred over electrical techniques for analyzing the dielectric properties and out of all techniques, Surface Plasmon Resonance (SPR) is most suitable. The theoretical simulations were done to find out the optimum thickness of ZnO and Polypyrrole composite films for sharp SPR reflectance values. Experimental studies were done to validate the theoretical studies and discussion were done about the interaction of NH3 gas with prism/Au/ZnO/Polypyrrole system. Tin oxide (SnO2), a versatile metal oxide due to its wide range of applications and its nature as an amphoteric oxide, has attracted researchers globally for many decades. The gas sensing layer in the SnO2/Polypyrrole nanocomposite multilayer structure system is used to design a sensitive and effective ammonia gas sensor device based on the phenomenon of Surface Plasmon resonance (SPR). The results obtained, highlight the usefulness of the SPR setup for the study of the Ammonia vapors interaction of the metal dielectric/Polypyrrole nanocomposite material. The outcome of these results validates the significance of SPR technique for application of interaction of surface adsorbed analytes, with the interface of dielectrics and sensing material.

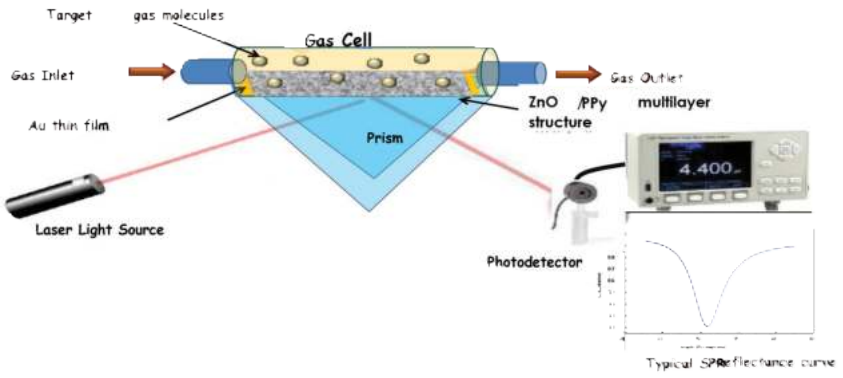

Figure: Schematic of the Kretschmann configuration based SPR gas sensor.

Biography

Ajay Pratap Singh Gahlot received his B.Sc. Physics (Hons) from Dyal Singh College, University of Delhi and M.Sc. degree in physics from the University of Delhi, New Delhi, India. Presently, working as Associate Professor, Department of Physics, Deshbandhu College, University of Delhi. His research interests are in the area of Condensed Matter physics, High temperature Superconductivity, Perovskite Solar Cell and the Study of Nanostructures based design of devices for gas sensing application. Presently, working on SnO2/ZnO /Polypyrrole Composite Nanomaterials and its various properties and applications. He has vast experience of teaching at different colleges. He is the life member of Math Tech Thinking Foundation: Fazilka, Punjab, India, Also, an affiliate member of Royal Society of Chemistry and American Chemical Society. Have experience of organizing several national & international conferences and seminars.

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ADV. ESCC 2022

Where will new antibiotics come from? some reflections

Heinz E. Moser

Novartis Institutes for BioMedical Research, USA

Over the past decades, the scientific community struggled to identify novel and safe antibiotics, especially against emerging, multi-drug resistant Gram-negative pathogens. This talk will focus on our current understanding of the chemical property space for antibiotics with activity against Gram-negative bacteria and outline possible opportunities of changes necessary to improve our success. While the problem is complex and multi-parameter driven, the focus here will be on property space and the chemical matter used in our screening efforts to identify novel and therapeutically useful antibiotics.

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Using expert knowledge to map the level of risk of shallow landslides in Brazil

E. A. Goto[1] and **K. Clarke**[2]

[1]*School for Environment and Sustainability, University of Michigan, USA*

[2]*Department of Geography, University of California, USA*

Shallow landslides are common in Brazil's urban areas. Geomorphology and land use are contributing factors, and rainfall is the triggering one. In these urban areas, anthropogenic activities that increase the level of landslide risk are common, such as cutting and filling or discharging wastewater onto the slopes. The Brazilian Government has developed a methodology to map the risk level in landslide-prone areas. The methodology is based on field observation and divides the risk into four main categories: low, moderate, high, and very high. Technicians in the field decide the sector's landslide risk level based on their professional and personal experiences, but without mathematical calculations or without using specific weights for the contributing factors. This study proposes a method for automatically computing the risk level by involving experts in deriving each classifier weight, thereby reducing the bias in selecting the final risk level. The weight calculation involved 23 experts on urban landslides, it was computed using the Analytical Hierarchical Process, and standard deviation was used to define the risk level threshold. We validated the study using a prior risk mapping of Sao Paulo city. Finally, an application (app) that can be used on a tablet, computer, or smartphone was created to facilitate data collection during fieldwork and to automatically compute the risk level. Risk areas in Brazil are frequently changing as new residents move to the area or changes in the buildings or terrain are made. In addition, mapping the risk areas is expensive and time-demanding for municipalities.

Therefore, an application that gathers the data easily and automatically computes the risk level can help municipalities rapidly update their risk sectors, allowing them to use an update risk mapping during the rainy season and be less dependent on rarely available financial resources to hire a risk mapping service.

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Comparing environmental impacts of Chinese Torreya plantations and regular forests using remote sensing

X. Chen[1] and **H. Chen**[2]

[1]*Department of Biological and Environmental Sciences, Alabama A & M University, USA*

[2]*Department of Biology, University of Illinois Springfield, USA*

The Chinese Torreya tree *(Torreya grandis cv Merrillii)* is a traditional nut tree cultivated in China for more than a thousand years. The income from the cultivation of this species for producing nuts, oil, and food has improved the local economy. Large industrial plantations of Torreya are under construction to achieve more profit, while this requires clearcutting local subtropical evergreen forests. It is necessary to evaluate the environmental impacts of land-use change at a large scale because of possible problems in sustainability. This research compared several biophysical indices from remote sensing data at a regular evergreen broadleaved forest and a nearby Torreya plantation. Our results indicated that the Torreya plantation had a lower albedo (12.43) and higher soil water storage within the surface 2 m soil layer (69.0 kg/m^2/month) than the regular forest (12.64 and 57.87 kg/m^2/month). The annual average Normalized Difference Vegetation Index (NDVI) was significantly higher in the regular subtropical forest landscape than in the Torreya forest landscape. Furthermore, these ecological processes' resilience was high in the regular forest than in the Torreya plantation. The large-scale development of Torreya plantations could change local energy and hydrological processes. Environmental impacts and multiple crucial ecological services should be considered for the sustainable development of Torreya plantations in this region. Our ground studies indicate less soil carbon storage and higher soil erosion risk in the Torreya plantations than in the natural forest. These results may be helpful for local agencies to create strategies to develop sustainable local economies while conserving the natural landscape. The approach to evaluating potential environmental impacts of landscape change at a large scale may be applied in other activities (agricultural development or urbanization).

Learning in lockdown: A case study in rapid transition to remote teaching

Jela WEBB

School of Business and Law, University of Brighton, UK

Disruption was the by-word for 2020. Across the globe organisations were affected by the COVID-19 pandemic and consequent lockdowns, which accelerated new ways of working and learning. In this presentation, I share my experiences of transitioning from a face-to-face model of delivering post-graduate education to a remote learning model. I also reflect on how the corporate sector might learn from my experience as it considers re-skilling and up-skilling the workforce to meet the demands faced by a changing jobs landscape.

The objective was to reflect on how a rapid transition to remote learning was implemented – the tools, techniques and training requirements. The scope focused on a specific module within an MBA programme but importantly considered how the learnings could be 'transferred' from an educational to corporate setting. A case study method was used with the researcher embedded in developing and delivering the remote learning content to MBA students. The conclusion was that the world of academia and the corporate world are having to change in the way they employ their workforces - increasing levels of automation, the use of AI and economic contraction will transform tasks, jobs and skills.

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Residential environmental exposure to agricultural pesticides and hematological malignancies: What do we know?

Blandine Vacquier[2], Camille Roingeard[1], Alain Monnereau[1,2,3], Stéphanie Goujon[4], Sébastien Orazio[1,2] and **Ghislaine Bouvier[2]**

[1]Gironde Register of Hematologic Malignancies, Institut Bergonié, France

[2]INSERM U1219 EPICENE Team, Université de Bordeaux, France

[3]French Network of Cancer Registries (FRANCIM), France

[4]INSERM U1153 EPICEA Team, Université Paris Descartes, France

Scope and objectives: Incidence rates of hematological malignancies have been constantly increasing over the past 40 years. In parallel, an expanding use of agricultural pesticides has been observed. Numerous articles reported a positive relationship between hematological malignancies and occupational, household or parental exposure to pesticides. Only a limited number of studies investigated the link between hematological malignancies risk and passive environmental residential exposure to agricultural pesticides in the general population. The purpose of our review was to summarize the current state of knowledge on that question.

Methods: A systematic literature search was conducted using PubMed and Scopus databases. We built a scoring scale to appraise relevance of each selected articles.

Results: We included 20 publications, mostly published over the last 15 years : 12 ecological studies, 7 case-control studies and a cohort study. More than the half of these studies were conducted in the USA. Exposure assessment methods differed widely : direct measurements, by-crop densities, total agricultural land density, pesticide sales, pesticide use reports, Geographic Information Systems. Positive significant associations were reported between hematological malignancies and some individual pesticides, some pesticide groups, all pesticides without distinction or some crop types. Relevance score was highly various across studies regardless of their design. Children studies were the majority and had overall higher relevance scores.

Conclusions: Reviewed epidemiological studies support some evidence of the effect of passive environmental residential exposure to agricultural pesticides on hematological malignancies risk. The main limitation of the literature available is the high heterogeneity across studies, especially in terms of exposure assessment approach. In order to improve our knowledge on health consequences of widespread use of agricultural pesticides on nearby residents, further studies with high methodological relevance should be conducted.

Breeding for impact: Perspectives on gender-Responsive cassava breeding in Nigeria

Hanna Ewell

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH,Germany

Crop breeding for improved varieties, able to withstand climatic variability, pests and diseases, as well as to meet food and market demands, has the potential to greatly improve the livelihoods of rural smallholders. However, the development of new varieties alone is not enough; they must also be demanded and cultivated by smallholder farmers. Increasingly participatory methods have allowed farmers to play a greater role in the decision-making process shaping the crop breeding agenda. Nevertheless, gender-specific preferences for traits, including cooking and processing characteristics, are often not determined until the final stages of variety evaluation or release, and even then, seldom prioritized – impacting adoption rates. Using the case study of cassava in Nigeria, this research aimed to analyze researchers' perspectives on gender-responsive breeding, as well as the extent to which integrating women's needs into the dissemination and marketing process can have a positive impact on empowerment pathways. The literature review and key informant interviews suggest that engaging both women and men regarding new cassava variety traits, and accounting for their differentiated needs and preferences in "product profiles", has the potential to better meet farmers' demands and thus, increase adoption rates of released varieties. Further research and collaboration are required to systematically develop product profiles that are gender-specific to enable inclusive agricultural transformation.

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Numerical and pictorial methods to assess the sustainability at the national level

José Fernando Romero-Cañizares and **Purificación Vicente-Galindo**
University of Salamanca, Spain

There are several approaches that measure sustainability at a nation level and rank the countries accordingly. The comparison of countries could be done numerically or graphically. There are two well-known numerical models: the Sustainability Assessment by Fuzzy Evaluation (SAFE) and the United Nations Sustainable Development Goals Index (UN-SDGs). SAFE uses basic indicators of environmental integrity, economic efficiency and social welfare. Through statistical analysis and fuzzy reasoning, SAFE determines measures of human, ecological and overall sustainability. Data about basic indicators are passed through an exponential smoothing filter to account for memory of past performance and then are normalized on [0, 1] according to their sustainability standing. Missing data are generated via an imputation procedure. Next a multistage fuzzy inference engine is used together with pertinent rule bases to obtain fuzzy values for composite sustainability variables. A height defuzzification procedure yields crisp sustainability numbers at each stage. The final number of overall sustainability is used to rank countries. Finally, a sensitivity analysis reveals those indicators that have the greatest potential of improving sustainability. UN-SDGs, indicator data are normalized over [0, 1] and then aggregated using an arithmetic mean. In the era of big data, artificial intelligence, and the internet, we need to leverage the power of statistical models to support effective leadership. To achieve this, we use two graphical approaches: Clustering disjoint HJ-Biplot and Variational Autoencoder plus graphical analysis (VAE&GA). These approaches perform a graphical ranking that makes the sustainability standing of countries very transparent. The main contribution of CD HJ-biplots and VAE&GA is their ability to graphically present a large amount of data, containing numerous entities such as countries and indicators. As expected, the pictorial models yielded similar rankings to those of SAFE and UN-SDGs, but also grouped countries according to their most important indicators, given a more global picture of sustainability.

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Understanding the cognitive gap between humanitarians and survivors during humanitarian operations

Diego Otegui
University of Central Missouri, USA

This article intended to add clarity about the role of symbolic constructions used by humanitarian executives and disaster survivors to relate with one another. A total of 30 purposefully sampled decision-makers were interviewed using a semi-structured questionnaire. The conversations were transcribed in full and analyzed using a deductive approach. The article undergoes an analysis of the institutional logics that are used by both collectives in the aftermath of a disaster. Data from field research trips to Mexico, Dominican Republic, Puerto Rico, and Mozambique were also used. Considering the limited amount of data collected, the findings of this article cannot be considered representative of the global humanitarian community. But it provides crucial insights to open a new field of research that has not received enough attention yet: the role of symbolic constructions in the relationship between different collectives during international humanitarian interventions. The research supports that disasters affect the cognitive structures of international humanitarian actors and local stakeholders alike but in different ways. Because of this, their post-disaster institutional systems are unarguably different. Consequently, how they perceive and interpret the new post-disaster reality is different, having important implications in the way they relate.

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HEMP (Cannabis sativa L.): An ancient crop as a modern ecosystem service for agriculture

G. Sorrentino, E. Garozzo Zannini Quirini and **G. Di Prisco**

Institute for Sustainable Plant Protection, National Research Council, Piazzale Enrico Fermi, Italy

Italy is the first country in Europe for the development of the circular economy and the cultivation of hemp can represent a strong driving force for the development of sustainable agriculture with high added value. Because of its high degree of environmental sustainability, hemp is considered an eco-compatible plant with a strong action to contrast climate change and desertification, with also a favorable effect on biodiversity. The Italian Law of 22 November 2016, which reintroduced the possibility of cultivating Cannabis Sativa L., can encourage the reactivation of agro-industrial chains, that can allow all the different parts of the plant to be used such as seeds (for oil and flour in the agri-food sector), stem (for the fiber in the textile sector and the canapulo in the industry of green building) and inflorescences, for the para- pharmaceutical sector. Thanks to its rapid growth compared with other similar crops, it can store large quantities of C02 in its stem and roots with quantities ranging from 12 to 22 tons per hectare, depending on the vegetative development of the crop. A more recent study has also shown that hemp treated with partially organic fertilizers, such as UREA, compared to synthetic ones, such as ammonium nitrate (NH4NO3), favors greater biomass development, better seed quality and, at the same time, reduces N2O emissions from the ground to the atmosphere. In addition, agronomic studies in the Mediterranean area have demonstrated a greater adaptability of hemp to salt soils compared to other renewal crops such as maize, showing a lower reduction in agronomic yield when the electrical conductivity of the soil increases from 2 ds/m-1 to 7.5 ds/m-1. So, the crop is well suited to Southern Italy agriculture that has many soils subject to desertification phenomena and whose climate has already far exceeded the limits imposed by the Paris agreements (COP21).

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Polygon generation and deep learning for performance prediction of energy-intensive industrial systems

Mohamed Elhefnawy[1,2], Ahmed Ragab[1,2] and **Mohamed-Salah Ouali[2]**

[1]*CanmetENERGY, Natural Resources Canada, Canada*

[2]*Department of Mathematics and Industrial Engineering, Polytechnique Montréal, Canada*

Monitoring and control of complex energy-intensive industrial systems is an urgent need for minimizing their harmful greenhouse gas (GHG) emissions. Fortunately, these systems are equipped with enormous number of sensors, resulting in data that express the behavior of their whole process. This presentation proposes a novel data representation method that maximally exploits these collected data through converting the observations into informative polygons. These polygons represent all interrelationships between the system input variables and outputs through Hamiltonian cycles. These generated polygons are fed into sophisticated deep learning (DL) architectures such as convolutional neural network (CNN) for accurate classification or conditional generative adversarial network (cGAN) for accurate multi-output regression. This proposed prediction method was validated using different benchmark and real industrial case studies for fault diagnosis and key performance indicators' (KPI) prediction; Tennessee Eastman process (TEP), a reboiler system of heat recovery network in thermomechanical pulp mill and black liquor recovery boiler (BLRB) in Kraft pulp and paper mill. The proposed prediction approach outperformed other classical and state-of-art machine learning (ML) and DL predictors. The results obtained demonstrate the effectiveness of our proposed method in terms of accurate modeling of complex highly non-linear industrial systems. Accordingly, this helps the stakeholders move towards better decision-making process to minimize their environmental footprint.

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Recycling spent coffee ground in sustainable building and construction materials: A review

M. Saeli

Department of Architecture, University of Palermo, Italy

This paper discusses the development of sustainable bio-composite hydraulic mortars intended as novel building and construction materials. Specimens were produced by upcycling spent coffee ground, a major residue of the brewing process, in light of the Circular Economy approach. This bio-waste has been recently found to be harmful for the environment and humans if landfilled, hence finding alternative solutions is extremely important to limit its footprint. In this review, the possibility of reusing spent coffee ground as mortars' aggregate is discussed. Various typologies of binders and wastes quantities are tested to foresee possible applications in construction. The materials engineering performance was deeply investigated to predict the feasible applications. The major results are that the used coffee waste, along with the binders' blend, deeply influences the engineering properties of the developed materials. In particular, by improving the waste amount the bulk density and the mechanical performance tend to decrease; nevertheless, the most of the tested mix could find proper uses for masonry applications according to the relevant standards. Moreover, the observed encouraging energy performance makes all the formulations efficacious for energy applications in architecture granting financial saving in the building yearly management for the deep energy efficiency improvement of the building envelope. The high amount of reused bio-waste makes the material highly green and a promising candidate for the Environmental Minimum Criteria (CAM) certification, in light of the recent EU regulations. Sustainability is also boosted by the manufacturing process that completely occurred at ambient conditions (20 °C, 65% RH) by simple operative steps reproduceable in a real construction site. Finally, a promising alternative reuse of spent coffee ground is proposed to the conventional landfill, that has been found to be potentially harmful to the natural environment and humans, making also the developed mortars greener, in light of the Circular Economy approach, and cheaper.

From the Globe with love: Science Diplomacy 4 Environment

Veronika Wittmann

Global Studies, Johannes Kepler University Linz, Austria

The interaction between the globe and the environment is a close one. In the international context environmental sustainability is a working track within various organizations and forums at the UN. Addressing environmental issues is also demonstrated at a regional level by the policy efforts of the EU and its Green Deal. The international community has managed so far to set up international legal treaties to reduce environmental risks faced by humanity. In order not to subject coming generations to the genuine threat of weakening life support systems on earth ensuing the destabilization of the planet there has to be a joint effort by various stakeholders like scientists, diplomats and policy-makers.

Taking an overall view, environmental diplomacy as an intersection where scientists, diplomats and policy-makers can jointly elaborate the complex interplay between technological developments, world-societal impacts and environmental issues is outlined. Environment and digital technologies are essential cornerstones for the future of humanity and are more and more becoming parts and parcel of global politics and international relations. As such, environmental diplomacy as a tool for humanity to manage jointly future risks scenarios is highlighted.

Science Diplomacy4Environment is not a panacea for all global challenges, but it is an important tool for humanity to manage joint future risks scenarios in a peaceful way. Achieving global stability, enhancing human security and conserving a livable environment are hereby inextricably linked to each other. Considering the limited time horizon of achieving the Paris Climate Agreement targets, it is highly relevant to assess how synergies between various stakeholders can be comprehensively exploited by coordinated action. Environmental diplomacy and green digital diplomacy are promising pathways to achieve a sustainable future across the globe.

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Using the Internet of Things to promote alternate wetting and drying irrigation for rice in Vietnam's Mekong Delta

Vu Bang PHAM[1], Thanh Tung DIEP[1], Karin FOCK[2] and Thai Son NGUYEN[1]

[1]Tra Vinh University, Tra Vinh Province, Vietnam

[2]World Bank (Consultant), Vietnam

The livelihoods of millions of rice farmers in Vietnam's Mekong Delta have become increasingly vulnerable due to reduced rainfall and the resulting water stress. In this context, promoting water-saving practices, such as alternate wetting and drying technology, is vital to sustain rice production and enhance people's resilience to climatic changes in the Delta. Since this technology is not widely applied in the region, this study hypothesized that a precise water measurement using the Internet of Things technology could facilitate the uptake of the alternate wetting and drying in rice cultivation practice. The study applied a rigorous research design to assess the differential benefits of applying the technology with sensors. Participating farmers were divided into three treatment groups that produced rice using either the continuously flooded irrigation technique, manual alternate wetting and drying tubes, or tubes with sensors. The on-farm trials' results showed that the precise water level measurements with the sensors allowed the farmers to maximize the benefits from alternate wetting and drying irrigation. The experimental results indicated an additional 13% to 20% of water savings over manual alternate wetting and drying. The technology also reduced irrigation energy costs by 25% and moderately enhanced rice yields by 2% to 11%. The pilot was the first to demonstrate in a large-scale open-field trial that it is feasible and beneficial for smallholder farmers to apply cutting-edge Internet of Things technology to increase water use efficiency in their rice farms. The technology adoption would significantly contribute to sustaining the agriculture-based livelihoods of people in the Delta.

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Finite element analysis for identifying locations of cracking and hydraulic fracturing in homogeneous earthen dams

Priyanka Talukdar[1] and **Arindam Dey**[2]

[1]*WSP Golder, Canada*

[2]*Indian Institute of Technology Guwahati, India*

This paper reports a finite element study to identify the locations of crack initiation in a homogeneous earthen dam at its post-construction and reservoir operation stages. The steady state and transient analyses, including reservoir rise-up and drawdown conditions, are simulated to identify the favorable conditions and locations of crack generation. The behavioral response of the dam is represented in terms of the developed total stress, horizontal deformations of the faces, strain accumulation in the dam, and the differential settlement of the dam base. The locations of post-construction cracks are identified based on the negative minor principal stresses developed on the dam faces. For both single-lift and multiple-lift modeling techniques, the upstream face of the dam is found to be the most favorable location for the crack generation. For transient reservoir operations (rise-up and drawdown scenarios), it is identified that hydraulic fracturing may occur on either faces of the dam at specific heights, governed by the minor principal stresses becoming lesser than the developed pore-water pressure. Depending on whether the reservoir drawdown occurs before or after the attainment of steady-state phreatic level within the body of the dam, the pore-water pressure distribution within the dam are found notably different. This results in hydraulic fracturing occurring at different faces of the dam and at different heights. It is important to have a thorough understanding of the tentative location of the cracks developed in homogeneous earthen dams so that proper mitigation measure can be adopted as per requirement.

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The homophily principle in social network analysis: A survey

Khanam Kazi Zainab[1], Gautam Srivastava[2] and **Mago Vijay[3]**

[1,3]Lakehead University, Canada

[2]Brandon University, Canada

In recent years, Social media has become a ubiquitous and integral part of social discourse. Homophily is a fundamental topic in network science and can provide insights into the flow of information and behaviours within society. Homophily mainly refers to the tendency of similar-minded people to interact with one another in social groups than with dissimilar-minded people. The study of homophily has been very useful in analyzing the formations of online communities and has been vastly studied in different types of social media data, ranging from textual data (Twitter tweets) to follower lists of online social accounts. However, no detailed survey has been conducted to date based on the works of social media networks related to the homophily principle. Therefore, the main aim of this article is to focus on providing a thorough review of the related works conducted on social media networks based on the homophily principle. We review and survey the effects of homophily in social networks and summarize the state-of-art methods that have been proposed in recent years to identify and measure those effects in multiple types of social networks. The homophily principle was also used to study the exchanging views about global warming on Twitter. The online debate on climate change was studied, and the degree of homophily among the individuals was measured on the number of times the edges were connecting users on homogeneous/ heterogeneous views. The high frequency of edges between the homogeneous users, and similarly, the low frequency of edges between the heterogeneous users were considered as the measure of homophily. The users' attitudes towards global warming were classified based on their message content. The social networks were categorized by opinion-based homophily and the users were manually labelled as "skeptic" and "activist" groups based on their message content. Results have shown that users generally communicate only with other similar-minded users, in communities that are influenced by a common view. Moreover, the messages of like-minded users have shown to be a positive sentiment in most cases, whereas, messages from skeptics held a more negative sentiment.

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Customer satisfaction and brand loyalty to electronic home appliances in Bangladesh: The contingent role of brand trust

Abu Bakar Abdul Hamid[1], Md. Uzir Hossain Uzir[1], Ishraq Jerin[1], Ahmad Shaharudin Abdul Latiff[1] and **Ramayah Thurasamy[2]**

[1]*Putra Business School, Malaysia*

[2]*School of Management, Universiti Sains Malaysia (USM), Malaysia*

In Bangladesh, customers are accustomed to electronic home appliances due to family structure, higher income levels, and technological affiliation. The huge customer base, increasing demand, emerging markets, acute competition among the brands, and changing customer behaviour are remarkable; nevertheless, customer satisfaction and loyalty are not static, and are somewhat changeable. The lack of extensive research on satisfaction and loyalty in this context is the motivation for this research. This study attempted to inspect the role of customer satisfaction and its predictors on brand loyalty and the role of brand trust in these relationships. The study was conducted in Dhaka, Bangladesh, with 486 respondents. The structured survey questionnaires were selected using the shopping mall-intercept sampling technique, where measurements were adapted from the literature. Elementary analyses were done using SPSS, and hypotheses were tested using PLS-SEM. The findings reveal that customer satisfaction fully mediates the impacts of the product's functional quality, customer perceived value, and customer-brand experience on brand loyalty; and various levels of brand trust signify customer satisfaction and loyalty relationship. The research framework was supported by the stimulus–organism–response theory, where product quality, customer value, and experience are successful stimuli, and satisfaction and brand trust are strong organisms. Marketing stimuli expose loyalty to the brand through the satisfaction and trust organism. The practicing managers might concentrate on satisfaction by developing home appliances to make them loyal to the brand and build customer trust on that brand to strengthen this relationship. The findings signify contextual and methodological contribution.

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Monitoring of atmospheric polycyclic aromatic hydrocarbons by polyurethane foam-Passive air samplers in Bangladesh: Source apportionment and health risk assessment

Aklima Nargis[1,2,3], Ahsan Habib[2,3], Shizhen Zhao[2], Refayat Nigar[2], Xin Liu[2], Gan Zhang[2] and **Minggang Cai[1]**

[1]Coastal and Ocean Management Institute & State Key laboratory of Marine Environmental Science, Xiamen University, China

[2]State Key Laboratory of Organic Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, China

[3]Department of Chemistry, University of Dhaka, Bangladesh

Bangladesh is one of the most populated countries in the world. Rapid industrialization and urbanization in the last decades have caused emission of pollutants in the environment. The aim of the study was to assess atmospheric 16 polycyclic aromatic hydrocarbons (Σ16PAH) in Bangladesh using PUF-PASs deployed in 5 metropolitan cities and one large non-metropolitan city from December 2017 to September 2018. Spatial distribution of Σ16PAH ranged from 3.6±1.1 to 22.4±6.9 ng/m3. The maximum concentration of 22.4±6.69 ng/m3 was found on the site-23 (urban), a newly established metropolitan city. Reasonably, the lowest concentration (3.6±1.1 ng/m3) was recorded at the rural site (site-7). Seasonal variation of Σ16PAH was found to be 4.8-28.4, 2.2-12.0 and 2.7-30.5 ng/m3 in the winter, pre-monsoon and monsoon, respectively. Among the PAH isomers, phenanthrene, fluoranthene and pyrene significantly contributed to the total concentrations of PAHs with 30.4, 27.8 and 20.1% in the winter, 18.9, 29.4 and 21.9% in pre-monsoon and 14.2, 29.9 and 21.9% in monsoon, respectively. Seasonal variation of PAHs followed the decreasing order: winter > monsoon > pre-monsoon. Molecular weight-based results revealed that 4- and 3-rings PAHs (4-rings: 53-60%; 3-rings: 23-37%) mostly contributed to the total concentration of PAHs. Diagnostic ratios, PMF model and PCA results suggested that combustion of coal, petroleum, and incineration of biomass/plastics and municipal solid waste are the primary sources of PAHs in Bangladesh. Calculated BaPTEQ and BaPMEQ and ICR values were higher for the children than that of the adults. The higher values of the BaPTEQ and BaPMEQ and ICR compared to those suggested by the WHO and USEPA, imply that population of Bangladesh, particularly children, may be at high risk for health problems from PAHs.

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Dose-effects models for space radiobiology: An overview on system dose-effect relationship

A. Bartoloni[2], L. Strigari[1], A.N. Guracho[2], S. Strolin[1] and **A. G. Morganti[3]**

[1]Department of Medical Physics, IRCCS Azienda Ospedaliero-Universitaria di Bologna, Italy

[2]Istituto Nazionale di Fisica Nucleare (INFN) Rome-Sapienza Division, Italy

[3]Radiation Oncology Center, School of Medicine, Department of Experimental, Diagnostic and Specialty Medicine – DIMES, University of Bologna, Italy

Space radiobiology is an interdisciplinary science that examines the biological effects of ionizing radiation on humans involved in aerospace missions. The dose-effect models are one of the relevant topics of space radiobiology. Their knowledge is crucial for optimizing radioprotection strategies, the risk assessment of the health hazard related to human space exploration, and reducing damages induced to astronauts from galactic cosmic radiation. Dose-effect relationships describe the observed damages to normal tissues or cancer induction during and after space flights. They are developed for the various dose ranges and radiation qualities characterizing the actual and the forecast space missions.

Based on a Pubmed search including 53 papers reporting the collected dose-effect relationships after space missions or in ground simulations, 7 significant dose-effect relationships (e.g., eye flashes, cataract, central nervous systems, cardiovascular disease, cancer, chromosomal aberrations, and biomarkers) have been identified.

For each considered effect, the absorbed dose thresholds and the uncertainties/limitations of the developed relationships are summarized and discussed. The current knowledge on this topic can benefit from further in vitro and in vivo radiobiological studies, an accurate characterization of the quality of space radiation, and the numerous experimental dose-effects data derived from the experience in the clinical use of ionizing radiation for diagnostic or treatments with doses like those foreseen for the future space missions.

The growing number of pooled studies could improve the prediction ability of dose-effect relationships for space exposure and reduce their uncertainty level. Novel research in the field is of paramount importance to reduce damages to astronauts from cosmic radiation before Beyond Low Earth Orbit exploration in

the next future. The study aims at providing an overview of the published dose-effect relationships with a particular emphasis on the central nervous systems effects and illustrates novel perspectives to inspire future research.

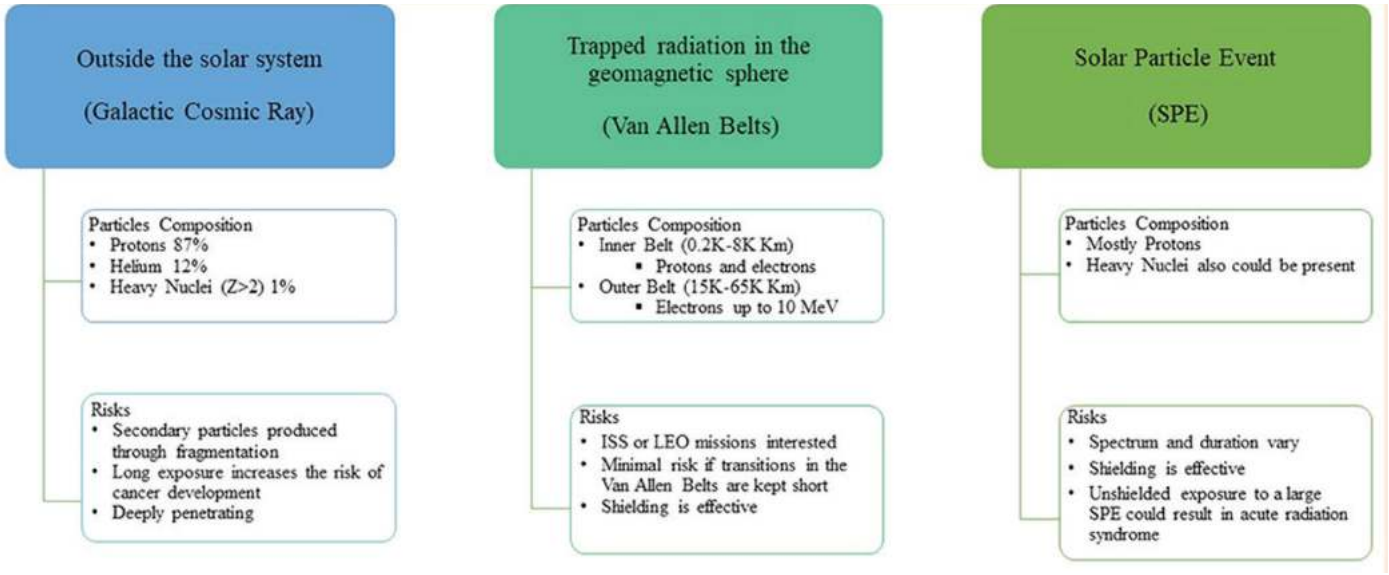

Figure 1. *Scheme of the origin of space radiation particles and consequent risk.*

Model	Study type	Dose range/threshold or LET	Reference	Reliability	Priority
Eye flashes	Spaceflight	LET> 5–10 keV/μm	(7–10)	****	*
Cataract	Spaceflight	8 mSv	(11–15)	***	***
CNS	Ground/Simulation	100–200 mGy	(16–27)	**	*****
CVD	Spaceflight	1000 mGy	(28–31)	*	***
	Ground/Simulation	(0.1–4,500) mSv	(32–39)		
Cancer	Spaceflight	<100 mGy	(40, 41)	***	*****
	Ground/Simulation	<100 mGy	(42–50)		
Biomarkers or	Spaceflight	5–150 mGy	(51–61)	***	*****
Chromosomal aberrations	Ground/Simulation	<10,000 mGy	(62–65)		
Other Risks	Ground/Simulation	~2,000 mGy	(66, 67)	*	***

* = Very Low, ** = Low, *** = Medium, **** = High, ***** = Very High.

Table 2. *Dose-effect relationship for space radiation risk assessment.*

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Microwave radiation as a natural characteristic of heat processes at the ocean surface and in the atmosphere

A. Grankov, A. Milshin and **E. Novichikhin**

Fryazino Branch of the Kotel'nikov Institute of Radioengineering and Electronics RAS, Russi

We can observe various processes in the World Ocean which exert influence on the weather conditions and people life activity: there are exist and modify constantly power currents transporting a heat to the continents, the strong hurricanes are originating and propagating, the temperature anomalies and heat fluxes at the water-air boundary are arising regularly. These phenomena have mainly a heat nature and can be manifested themselves through the natural radiothermal (microwave) radiation observed by special means of remote sensing the Earth from space.

Such areas of the World Ocean as the Gulf Stream, Newfoundland, Norwegian-Greenland energy active zones of the North Atlantic, as well as the Gulf of Mexico can serve as natural testing grounds for testing the possibilities of studying heat and dynamic processes at the interface of the ocean and atmosphere using satellite microwave radiometry. The significant brightness temperature contrasts regularly observed here are clearly recorded from space in the spectral absorption region of microwave radiation in atmospheric water vapor, which can serve as a kind of "radio visibility window" for analyzing from space such processes on the ocean surface and in the atmosphere as:

- Heat and dynamic interaction between the ocean and the atmosphere;
- Transformation of the characteristics of the ocean and atmosphere in the frontal regions;
- Origin and spread of tropical hurricanes (in the range of synoptic time scales)
- Seasonal and long-term variations in the intensity of heat and moisture exchange between the ocean and the atmosphere in energy-active zones;
- Long-term variations in the intensity of the transfer of sensible and latent heat in the atmosphere in areas of ocean currents. (in the range of seasonal and interannual time scales)

The report provides various examples of using the data of satellite measurements in this microwave window to solve these tasks.

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Optimization of process parameters in the upgrading of *Scenedesmus obliquus* oil to high-quality liquid-phase biofuel by nickel-impregnated biochar catalyst

Alexander L. Ido[1], Mark Daniel G. de Luna[2], Dennis C. Ong[3] and **Sergio C. Capareda[4]**

[1]*College of Engineering and Technology, University of Science and Technology of Southern Philippines, Philippines*

[2]*Department of Chemical Engineering, University of the Philippines Diliman, Philippines*

[3]*School of Technology, University of the Philippines Visayas, Philippines*

[4]*Biological and Agricultural Engineering Department, Texas A&M University, USA*

This work investigated the optimization of process parameters in the upgrading of the oil extracted from Scenedesmus obliquus microalgae using a novel nickel-impregnated biochar catalyst. The effects of temperature, dodecane-to-oil mass ratio and pressure on the upgraded liquid-phase biofuel yield were evaluated and optimized using central composite design of the response surface methodology (RSM). The model equation generated from RSM show that dodecane-to-oil mass ratio and pressure, as well as the quadratic effects of all the three factors, were significant model terms in predicting the yield of upgraded liquid-phase biofuel. Maximum liquid biofuel yield was attained at 246.89 °C, 3.72 (w/w) dodecane-to-oil mass ratio and 3.84 MPa hydrogen pressure in 6 h processing time. Validation runs resulted in an upgraded biofuel yield of 69%, which is in close agreement with predicted values generated by RSM. The upgraded biofuel comprised of 100% green liquid hydrocarbons containing 94% alkanes and 6% alkenes. Its main fuel properties, such as heating value (43.78 MJ kg-1), elemental composition, density, and viscosity exceeded those of the fatty acid methyl ester standard and were found comparable to those of petroleum diesel. More importantly, ultimate analysis as confirmed by Fourier transform infrared and gas chromatography – mass spectroscopy analyses showed significantly low oxygen and nitrogen content and absence of sulfur in the upgraded biofuel.

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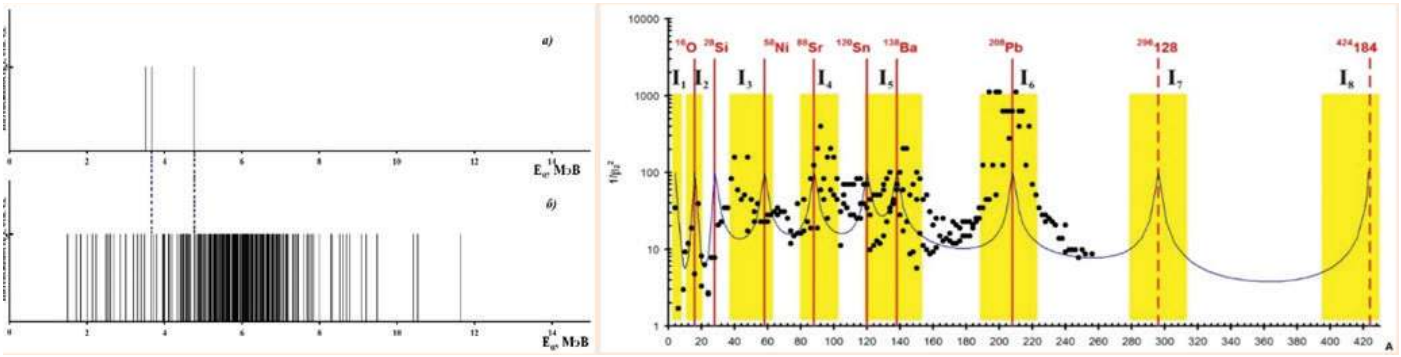
Spontaneous fission and spontaneous synthesis in clustered nuclear matter in non-euclidan spaces {Riemann Nuclear Physics}

A. Yushkov, V. Dyachkov and **Yu. Zaripova**
Al-Farabi Kazakh National University, Kazakhstan

The report outlines the contours of a new, discovered by the authors, nuclear physics, not based on the concept of "wave function" and does not require the solution of the Schrödinger equation - "Riemannian nuclear physics". Such a return to the deterministic Newtonian paradigm and Hamiltonian equations of motion is associated with the numerous contradictions accumulated to date between the quantum mechanical paradigm and the latest experimental data. A system of proofs of the need to apply to non-Euclidean geometry for all structures of matter in the microcosm is consistently given. Such a geometry was the metric of a Riemannian closed elliptic space with its multilayer division and a curvilinear geodesic that allows free motion along closed trajectories without radiation.

The purpose of our experiments on the beams of the Kazakh U-150m accelerator was to measure the geometric parameters of nuclei - the radii, the thickness of their surface layer, the signs and magnitudes of the quadrupole nuclear deformation. The second task was to experimentally prove that each nucleus contains clusters of nuclear matter, called multiclusters. Both goals have been successfully achieved. These papers describe in detail the methodology of the experiments, their results, and a thorough theoretical analysis. The figure shows the results of comparing the experiment with the consequences arising from Riemannian geometry, if the entire ZN-matrix of the hitherto discovered stable and radioactive nuclei is "immersed" in it.

The totality of the experimental and theoretical data obtained indicates that the non-Euclidean geometries of Lobachevsky and Riemann dominate in the microworld. In particular, along with the discovery of "Riemannian nuclear physics", the authors also managed to make related discoveries of new phenomena arising from it: 1) spontaneous nuclear fusion; 2) the existence of eight "islands of stability" and their localization; 3) to prove the existence of the fundamental boundaries of the periodic table, solar systems and the entire galaxy; 4) explain the existence of a flat solar ecliptic, in which all the planets move.



Left: *spectrum of alpha particles: a) calculated spectrum from a part of intranuclear fusion reactions for multiclusters with A=1-4; b) experimental spectra;*
Right: *surface β2(Z,N) of nuclear deformations for the ZN matrix of stable nuclei with extrapolation to the region of the 7th and 8th predicted islands of stability; 2D projection for the quadrupole deformation in the coordinates 1/β2= f(A)*

The impact of covid-19 pandemic preventing measures and meteorological conditions on the atmospheric air composition in Moscow in 2020

A. I. Skorokhod, V. S. Rakitin and **N. S. Kirillova**
A.M. Obukhov Institute of Atmospheric Physics, Russia

Changes in the atmospheric composition in different periods of 2020 in Moscow, associated with the COVID-19 pandemic preventing measures of varying intensity and with corresponding reduction in emissions of pollutants, were investigated. Surface concentrations of nitrogen dioxide NO2, carbon monoxide CO, ozone O3, aerosol fraction PM10 and meteorological parameters in different periods of 2020 are compared with similar data for the previous 5 years. The analysis of ground-based measurements, as well as high-resolution satellite distributions of CO and NO2, indicated that the content of major pollutants and its spatial distribution in the Moscow region were significantly affected by both restrictive measures and abnormal meteorological conditions in 2020.

Discharge coefficient of flow over Al Shalalat stepped weir on Al Khusr River

Azza N. Altalib
Dams and Water Resources Engineering Department, College of Engineering, University of Mosul, Iraq

Many hydraulic structures are constructed in an open channel according to the purposes and the nature of the region. Weir is one of these structures which is used for discharge measurements as well as rising water depth in irrigation channels. According to the crest, there are two different shapes: sharp and broad crested weir. A stepped weir is constructed to reduce scour that happened downstream. There are different studies dealt with discharge coefficient, energy dissipation, and other hydraulic characteristics for flow over the weir. In this study, the coefficient of discharge for the Al-Shalalat stepped weir on the Al-Khusr River has been evaluated. The discharge coefficient equation is predicted, and the result values are compared with previous studies. The percentage error for the predicted discharge equation presented in this study compared with previous studies does not exceed 10%.

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Development and application of refuse derived fuel from hazardous industrial waste

Balasubramaniam Karpan[1], Abdul Aziz Abdul Raman[1], Mohamed Kheireddine Taieb Aroua[2] and Archina Buthiyappan[3]

[1]Department of Chemical Engineering, Faculty of Engineering, Universiti of Malaya, Malaysia

[2]Centre for Carbon Dioxide Capture and Utilization, School of Science and Technology, Sunway University, Malaysia

[3]Institute of Ocean and Earth Sciences, C308 Institute for Advanced Studies Building, University of Malaya, Malaysia

Malaysia generates about 4.0 million tons of industrial hazardous waste (IHW) in 2021 and more than 70% of these wastes are landfilled and ii is a loss of energy resources as majority of these waste contains more than 8,000 kJ/kg of energy. Therefore, in this work selected industrial hazardous wastes were chosen to produce RDF (Refuse Derived Fuel) as a mean to recover energy resources. The RDF production process was developed by combining various processes of sorting, weighing, mixing, drying, and fused them together in a process called Thermo-biofusion. The optimum operating conditions of IHW and biomass mixture was based on the calorific value (CV), volatile matter, fixed carbon, ash and moisture content. A production process was developed, and the RDF was produced and tested for potential utilization as a coal alternative in a cement manufacturing plant with varying RDF ratios, utilizing the optimum recipe. This study concluded that every ton of coal with 24,000 kJ/Kg CV could be replaced by approximately 1.5 tones of RDF. In terms of the efficiency of clinker and stack gas emission values, the substitution of 15 % of RDF to the coal at a feeding rate of 5 tons per hour in cement production did not cause any processing and quality issues in the existing cement production process. The study concluded that substituting 15 % of RDF with the coal in 5000 ton/day cement plant may reduce 112.8 USD/hour in operating cost. The advantages of co-combustion RDF with coal in the cement plant including reduction in the CO2 emission, cost reduction of clinker production due to the usage of inexpensive fuel, and preservation of resources. This work has proven that by combining pre-selected IHW, mixture of biomass, and adding appropriate additives, a coal-like RDF can be produced for cement kiln application that meet the energy and emission requirements

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Flood hazard management in a multiple hazard context: A systematic review of flood hazard management during the covid-19 pandemic in Africa

Bashiru Turay
Department of Geography, University of Bonn, Germany

Result-oriented research can uncover hidden flood management obstacles and propose solutions that, if combined with political will, appropriate technology, and resources, can overcome the majority of Africa's future flood calamities. In view of this, it is critical to examine researchers' findings on flood hazard management, particularly now that the continent is struggling with COVID-19 and other hazards. This study employed a systematic review approach to critically analyze 103 contextually detailed studies with a set of criteria that were not only meant to keep the focus on floods and the COVID-19 pandemic but also to understand the context of managing floods during COVID-19 and other hazards at the same time on the continent. I found that the authors strongly recommend how institutions should create non-structural enabling environments for managing combined hazards. Also, researchers paid little attention to recommending ecosystem-based measures for flood management during the COVID-19 pandemic in Africa. Future research should study how different countries in Africa are preparing to manage multiple future hazards, including the comparative assessment of the strengths and weaknesses of individual countries' planning and preparation.

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The environmental aspects of conventional and clean energy policy in sub-Saharan Africa: Is N-shaped hypothesis valid?

B.A Ampomah[3], F.V. Bekun[1], A.A Alola[2] and **B.A Gyamfi[3]**

[1,2]Istanbul Gelisim University, Turkey

[3]Cyprus International University, Turkey

Most modern economies, especially those in the EU, have met some of their national environmental sustainability goal. And so these countries renew their programs for 2040, whereas the African bloc has a longer journey out of the woods. With this knowledge, we must reach inferences on the significance of conventional and renewable in Sub-Saharan Africa's environmental sustainability drive. Therefore this study examined the validity of an N-shaped hypothesis for sub-Saharan region which has received less documentation in the extant literature. This study employed the pooled mean group autoregressive distributed lag and Dumitrescu and Hurlin panel causality approaches as estimation techniques. Our empirical results show that conventional and renewable energy aspects respectively worsen and improve environmental quality in both short and long run. Importantly, the study establishes the validity of the N-shaped hypothesis in the two periods (short and long run) as reported by the study regression with 17.830% for GDP growth, −2.241 % for quadratic form of GDP, and 0.094% for cubic form of GDP growth, respectively, in the long run. Moreso, renewable energy shows a magnitude of −1.306% and −0.157% for short- and long-run period, respectively, on carbon dioxide emission. The implication is that environmental quality in the sub-Saharan region is potentially characterized in cycles of worse, improvement, and again worse resulting from the significant change in the region's economic prosperity. In addition to the ARDL approach, the causality analysis further reiterates that there is significant causality from the energy forms and economic expansion to carbon emission at least in one direction. While examining the validity of N-shaped hypothesis for the first time for Africa, the study offers policy perspective to the governments and environmental stakeholders in the panel countries, especially to re-engineer the region's economic dynamics if the region must meet the anticipated Sustainable Development Goals 2030

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Persistent organic pollutants in Colombia; Levels, challenges, and future perspectives

Boris Santiago Avila, Diana Pemberthy, Henry Zúñiga and **Gustavo A. Peñuela**
Universidad de Antioquia, Facultad de Ingeniería, Sede de Investigación Universitaria, Grupo Diagnóstico y Control de la Contaminación - GDCON, Colombia

Persistent Organic Pollutants (POPs) are persistent in the environment, bioaccumulate and biomagnify throughout the food chain, and adversely affect human health and wildlife. Under the Global Monitoring Plan 2 project, Colombia monitored the POPs concentration in core matrices such as air, breast milk, and fish. Moreover, as an independent study, polybrominated diphenyl ethers were measured in food commercialized and consumed by the population. Air monitoring was made with passive air samplers deployed between January 2017 and January 2019 in Medellin, Colombia. POPs in breast milk were quantified in a national combined sample. The national combined sample was made with 50 individual samples of primiparous and healthy mothers from Colombia. The fish samples were taken from the two principal rivers of the country (Magdalena and Cauca) and the Gulf of Uraba. Moreover, ten shrimp and ten animal-origin oil samples were taken from Medellin markets.

Air monitoring results suggested releases of DDT in the city or surrounding areas despite this pollutant being banned many years ago in the country (Figure 1). Moreover, the highest concentration quantified in breast milk was 69.1 ng•g-1 lipid for DDE (a byproduct of DDT). Furthermore, perfluorooctane sulfonic acid and perfluorooctanoic acid were quantified in fish samples from the Magdalena and Cauca rivers and Gulf of Uraba for the first time in the country, with mean values of 36.1 pg•g-1 for perfluorooctane sulfonic and 8.35 pg•g-1 for perfluorooctanoic acid. Moreover, the concentration of one shrimp sample was 0.012 ± 0.0056 ng•g−1 of BDE 100. The project results allowed establishing the baseline of some pollutants in the air city against which future temporal trends can be assessed. Additionally, these results could strengthen Colombia's efforts to increase the practice of breastfeeding. Finally, the results suggest that shrimps and animal-origin oils are not a significant source of exposure to polybrominated diphenyl ethers in the Medellín population.

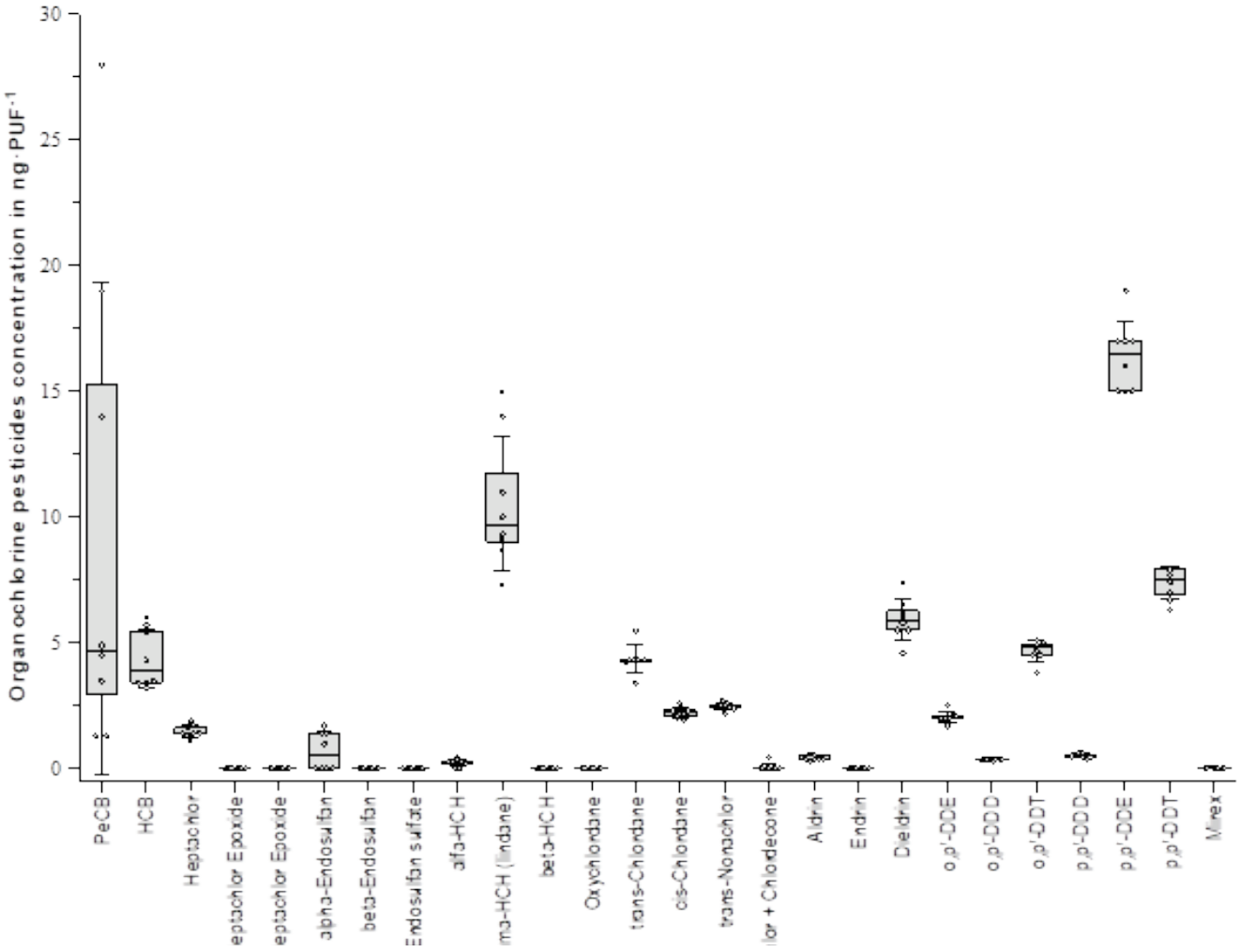

Figure 1 *Organochlorine pesticides concentrations in air (ng•PUF-1). Where an analyte was not detected, 0 was added.*

Scour evolution under flood events at engineering structures in flow

B.Gjunsburgs, K.Kokina and **M.Bizane**
Riga Technical University, Latvia

The mutual multiple floods and layering of the riverbed impact on scour hole evolution near structures in flow can be reason of failure because of scour. Although the problem is very topical, the mutual impact floods and the stratified riverbed layers on the scour at the structures has not been studied well. The aim of the laboratory tests with was to study the scour processes, the effect of the flow parameters , the contraction rate of the flow, grain size of the bed material, steady or unsteady flow conditions, and the scour evolution with time. The differential equation of equilibrium of the bed sediment movement in clear water and unsteady flow conditions was used to create a model for calculating the depth, width and volume of scour hole at the engineering structures in flow is elaborated. Based on the agreement of experimental and calculated results, the computer program was carried out to model time-dependent scour development during multiple floods with different duration, probability, frequency and sequence. The analysis of the influence of multiple floods showed that, with less probability, increased duration and frequency of the floods, and certain sequences of different probability, the scour depth, width and volume increases. It was confirmed that the scour depth evolution in floods depends multiple floods of different probability, sequence, duration, frequency, sequence and river bed parameters near the water engineering structures in flow.

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Three generations of Multi-Agent system for environmental simulation (MASE)

Cassio Giorgio Couto Coelho and **Célia Ghedini Ralha**
University of Brasília, Brazil

This talk presents a multi-agent model system to characterize land-use change dynamics. The evolution of MASE followed three generations. The first generation (Ralha et al., 2013), where the methodological two-fold approach intends to form a solid backbone based on: (i) the systematic and structured empirical characterization of the model; and (ii) the conceptual structure definition according to the agent-based model documentation protocol – Overview, Design concepts and Details (ODD). MASE was illustrated with a case study of the Brazilian Cerrado using LANDSAT ETM images. The simulation results prove the model importance with a figure of merit greater than 50%, what means the amount of correctly predicted change is larger than the sum of any type of error. MASE-BDI is the second generation (Coelho et al., 2016) introducing rationality to agents using a mentalistic approach with Belief-Desire-Intention (BDI) model. An auto-tuning approach aligned to parallelization techniques are employed to speed up the simulation execution times. Compared to MASE using the Brazilian Cerrado biome case reduces execution time by at least 82 X. MASE-EGTI is the third generation (Coelho & Ralha, 2022} with agents' decision model based on evolutionary game theory including three-dimensions: individual, peer-to-peer, and societal. The modeling structure includes Space, Time, Agents, Interactions and Public policy (STAIP). Experiments use real data form MapBiomas Brazilian public geographic database.

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Canyon Vortices: Application of the theory of topographic vortices to the phenomenon of ice rings in Baikal

D. Zyryanov, V. Zyryanov and **M. Chebanova**

Water Problems Institute, Russian Academy of Sciences, Russia

A phenomenon of ice rings in Lake Baikal is considered. A hydrodynamic theory is proposed according to which geostrophic vortices form under ice in the area near the ice rings. These vortices are due to bed relief, namely, underwater canyons; therefore, they are referred to as canyon vortices. It is shown that a divergent ring vortex forms under ice in the ring domain at the crossing of a vertical cylindrical Stewartson layer on the lateral surface of the canyon geostrophic vortex and under-ice horizontal Ekman layer in the form of a horizontal vortex torus, and the melting of ice below in the form of a ring is due to the formation of this vortex torus.

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Electrical performance of organic/inorganic hybrid solar cell devices based on n-type GaAs substrate orientations and a conjugated polymer (PANI)

D. A. Jameel

Department of General Sciences, College of Basic Education, University of Zakho, Iraq
School of Physics and Astronomy, Nottingham Nanotechnology and Nanoscience Center University of Nottingham, UK

This article presents the electrical performance of hybrid organic/inorganic solar cell devices. Hybrid polyaniline (PANI)/n- GaAs photovoltaic devices were fabricated by spin coating of PANI thin films on conventional (100) and high index (311) A and (311)B n-GaAs substrates. The solar cell parameters of these devices, as obtained by current density–voltage (J–V) under illumination conditions, were found to be dependent on the substrate orientation. The PANI/(311)A n-GaAs devices revealed the best performance, with an open-circuit voltage (Voc) of 207 mV, a short-circuit current density (Jsc) of 0.267 mA/cm2, a fill factor (FF) of 25% and an efficiency (η) of 1.4 x 10-2% which is higher than that of PANI/(100) and (311) B hybrid samples. Additionally, the electrical properties of these junction diodes have been studied utilizing dark current density–voltage (J–V), capacitance–voltage (C–V), deep level transient spectroscopy (DLTS) and Laplace DLTS techniques. The dark J–V measurements showed that the rectification ratio (IF/IR), turn-on voltage (Von) and barrier height (Φb) of PANI/(311)A n-GaAs heterostructure are higher than those of PANI thin films deposited on (100) and (311)B n-GaAs substrates. The DLTS and Laplace DLTS measurements illustrated that the number of traps in PANI/(311)A n-GaAs devices is lower than that in PANI/(100) n-GaAs and PANI/(311)B n-GaAs devices, corroborating with J–V results.

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Transfer printing on cotton knits

E. B. Sanzheeva, O. V. Kozlova, O. I. Odintsova and **T. N. Zelenkova**

Ivanovo State University of Chemistry and Technology, Russia

In the work, preference was given to synthetic polymers—modifiers of acrylic and urethane nature of domestic production. These are polymers as well as polymers based on urethanes—aquapols. The effectiveness of using the above-mentioned modifiers as primers for thermal printing was evaluated by a set of qualitative indicators of the colors: color saturation (intensity), the strength of the colors to friction, the degree of transfer of the dye from the paper substrate to the fabric. For the sublimation transfer of dyes to the fabric, a thermal press, model SFS-MO4B, was used. The objects of the study were bleached cotton knitted fabric. Dispersed dyes of domestic production which were used for printing on paper. Of interest is the compatibility of the selected dyes evaluated by the authors when using them in combination with each other and printing with dispersed Blue K on fabric modified with polyurethanes. The compatibility of the dyes in the mixtures is confirmed by the absence of shading between the samples processed under different heat treatment conditions, and, consequently, by the proximity of the color tone indicators.The transfer of dyes from paper was carried out on cotton knitted fabric. According to the data of L, a, b taken from the spectrophotometer, graphs were plotted, on which it can be seen that the locations of the resulting colors almost clearly fit on the lines of a constant color tone, which confirms the good compatibility of the dyes in the selected triad in terms of sublimation properties. Results: The optimal conditions time 10–20, T of 200°C. The evaluation of the compatibility of dispersed dyes in the selected triad when used in combination with each other confirms the good compatibility of dyes in terms of sublimation properties.

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Home ownership for liveable city in Malaysia

E. S. A. Shakur[1], C. H. Choong[1], S. A/P Sivanathan[1] and **A. F. Mohamed[2]**

[1]Department of Building and Property Management, Faculty of Accountancy and Management, Universiti Tunku Abdul Rahman (UTAR), Malaysia

[2]Institute Environmental and Development (LESTARI), Universiti Kebangsaan Malaysia (UKM), Malaysia

Home ownership is one key factor of the principles of livability towards achieving liveable city. In addition, there are also many factors affecting home ownership which includes income, location and accessibility factor. Various issues have been discussed by the Government of Malaysia in addressing the concern of home ownership, especially for the middle- and low-income groups in many cities in Malaysia. Using the case of Petaling Jaya city, this article aims to achieve the objective of identifying the major factors affecting home ownership for liveable city focusing the middle-income earners. Purposive sampling was used and in-depth interviews method were conducted with 80 homeowners and 20 housing experts representing the Federal Government agencies, State Government agencies, Municipal Government, Developers, Urbanice Malaysia and Banks. The result of the study shows that the main factors affecting home ownership are income, housing loan scheme, location, government role, developer role, PR1MA affordable housing scheme, construction cost, Bumiputera quotas, lifestyle, quality of life, real estate investment and transfer, assessment/property tax, land ownership by foreigners and ownership title. The findings show that the Petaling Jaya City is an example of a city that can contribute to the affordable housing strategy requirements towards achieving liveable city. The findings also will help key stakeholder in addressing the main issues of housing affordability in the State of Selangor.

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The impact of disasters on economic growth in selected Southern Africa development community countries

E. Owusu-Sekyere[1], W. Lungar[2] and **Karuaihe S.T[3]**

[1]Human Sciences Research Council, South Africa
[2]African Centre for Disaster Studies (ACDS), South Africa
[3]Department of Agriculture Economics, Extension and Rural Development, University of Pretoria, South Africa

This research study explores the impact of disasters on economic growth in selected Southern Africa Development Community countries. Annual data from 2005 to 2019 and panel data econometric estimation techniques are used in this study. The estimation approaches used control for both pooled and individual effects, heteroscedasticity, serial correlation, moderate levels of endogeneity and cross-sectional dependence (CSD). We found that although the impact of disasters on economic growth may be negative contemporaneously, reconstruction and recovery activities if well-resourced could facilitate building back better, which could ultimately lead to positive outcomes on economic growth a year after the disaster. We further tested the hypothesis in existing literature and confirm that quality institutions, favourable financial conditions and adequate access to international markets enhance a country's coping and adaptive capabilities to disasters, thereby reducing the country's level of risk to disasters. Keywords: natural hazard; disasters; dynamic panel data econometrics; economic growth; South Africa; Southern African Development Community; SADC.

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Evaluation of the EIA process in Zanzibar: The participation of stakeholders in public and private projects

F. F. Fangninou[1,3], P. M. Kaku[1,3] and H. Zhu[1,2,3]

[1]State Key Laboratory of Pollution Control and Resources Reuse, Key Laboratory of Yangtze River Water Environment, Ministry of Education, College of Environmental Science and Engineering, Tongji University, China

[2]Shanghai Institute of Pollution Control and Ecological Security, China

[3]UN Environment -Tongi Institute of Environment for Sustainable Development, College of Environmental Science and Engineering, Tongji University, China

Background & Aim: Environmental Impact Assessment (EIA) is an anticipatory tool for environmental management and decision making in projects, which success depends on the participation level of stakeholders 1. The study assessed the relationship between participation-satisfaction of stakeholders in the EIA process based on 30 projects in Zanzibar.

Methods: Semi-structured questionnaires (n=470) were employed to assess the core function, interest-influence, participation and satisfaction of stakeholders in the EIA process. MLR and OLS were used to identify key determinants that affect stakeholders' satisfaction.

Results & Discussion: 55% of stakeholders were involved in the EIA process mainly dominated by government institutions (Fig. 1b). However, NGOs are the stakeholders having a poor influence on the EIA (Fig. 1a) and weak social networking with core stakeholders, which is non-consistent with the role they play to increase the EIA legitimacy to overcome barriers to participatory practice 2. Moreover, the overall satisfaction of the stakeholders was basic (Ms=3.14), due to the lack of participatory approach appliance and the top to down decision making taken by the government 3. Finally, detailed and informative project knowledge, as well as the use of the participatory approach, have a positive impact on satisfaction with public project success, and this is consistent with other recent findings that see them as major satisfaction drivers 4-5

Conclusion: The study suggests increasing public participation in decision-making is likely to improve all the stakeholders' satisfaction in the EIA process thus project success.

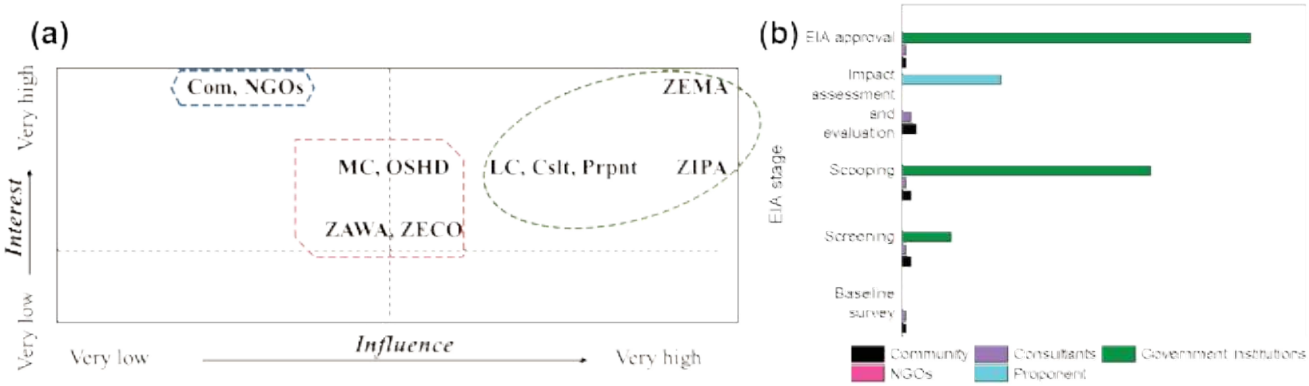

Figure 1. *Stakeholders' analysis (a) and involvement in the EIA process (b)*

Stakeholder groups	N	Ms	Rank
Community	230	2.26	2
NGOs	10	1.0	1
Proponent	30	3.0	4
Consultants	20	2.5	3
Government institutions	180	4.44	5
Overall	470	3.13	-

Table 1. *Satisfaction mean score ranking*

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Creative destruction or just destruction? Effects of floods on manufacturing establishments in India

Farzana Hossain
Centre for Health Economics, Monash University, Australia

Climate change is projected to increase the frequency and severity of flooding. In this paper, I examine the direct consequences of floods on manufacturing establishments in India as well as indirect effects on the entire manufacturing sector through the sectoral reallocation of labor. I construct a unique panel dataset of flood inundations using high-precision satellite images, which I match with formal and informal sector establishment-level data. I show that floods cause a significant reduction in output, capital, and employment in formal establishments. I also document significant heterogeneity in vulnerability and resilience to floods within the formal manufacturing sector. The least-productive formal establishments are the most vulnerable to floods: a 10 percentage point increase in flood exposure leads to a 0.6 percentage point increased probability of exit among low-productivity firms. I do not observe any associated labor reallocation to more productive establishments, which could support the creative destruction hypothesis. Rather, I find suggestive evidence of labor reallocation to informal household-run microenterprises. As there is a large labor productivity gap across formal and informal sectors, I show that because of the disaster-induced labor reallocation, a 10 percentage point increase in the incidence of flooding causes a 15.3 percent reduction in aggregate productivity in the manufacturing sector.

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Detection of aquifer recharge zones in isolated wetlands: Comparative analysis among electrical resistivity tomography arrays

Fernanda Teles Gomes Rosa[1], César Augusto Moreira[1], Vania Rosolen[1], Matheus Casagrande[1], Renata Cristina Bovi[2], Lucas Moreira Furlan[1] and Shaiely Fernandes dos Santos[3]

[1]University of São Paulo State (UNESP), Brazil

[2]University of São Paulo (ESALQ-USP), Alameda do Brejo-Agronomia, Piracicaba, Brazil 3Earth Sciences Sector, Federal University of Paraná (UFPR), Brazil

For the evaluation of the internal water fluxes of wetlands and comprehension of their function within the hydrological cycle, the electrical resistivity tomography technique is a high-performance tool for the modeling of hydrodynamic environments, comprising data acquisition procedures based on transmission and reception sensors of electric potential fields as a result of predetermined configuration and the selection of arrays. The utilization of appropriate arrays is fundamental to obtaining data that truly represents the local geology, while an incorrect geometric configuration of electrodes might lead to failure to detect anomalies, impacting the comprehension of the dynamic processes. This research was conducted to make a comparative analysis of electrical resistivity tomography data acquired through Schlumberger, Wenner, and dipole-dipole arrays, which were supported by direct soil hydraulic conductivity data and vegetation analysis, allowing the correlation of surface infiltration zones and their continuity in-depth, making possible an evaluation of the array that best represents the study area in terms of soil, rock, and flux dynamics. The results revealed the Schlumberger array as the best electrode configuration for modeling, with the best correlation with direct surface data, which might be explained by the predominance of a horizontalized potential electric field flux, good signal-to-noise ratio, and discrimination capacity of vertical flux structures. Therefore, the results indicate the existence of a structure of water access and direct recharge for the regional aquifer (Tubarão aquifer system), characterized as a closed topographic depression located in a region of sugarcane farming.

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Numerical investigation of liquid nanofluids based Photovoltaic/ Thermal (PV/T) system with square tube absorber configuration

Ghassan F. Smaisim[3,4], Azher M. Abed and **Hasan Sh. Majdi[2]**

[1]*Air Conditioning and Refrigeration Techniques Engineering Department, Al-Mustaqbal University College, Iraq*

[2]*Department of Chemical Engineering and Petroleum Industries, Al-Mustaqbal University College, Iraq*

[3]*Department of Mechanical Engineering, Faculty of Engineering, University of Kufa, Iraq*

[4]*Nanotechnology and Advanced Materials Research Unit (NAMRU), Faculty of Engineering, University of Kufa, Iraq*

In addition to collectors, photovoltaics (PV) are combined to form photovoltaic thermal (PVT) collector systems to increase collector efficiency. The solar photovoltaic efficiency decreases with increasing ambient temperature, mainly due to the increase in the internal carrier recombination rate. The electrical output and power output of a (PV) module is highly dependent on the operating temperature. PVT collector systems work by absorbing the heat collected from the sun by the PV panels and converting that heat into electricity. CFD simulations were used to study the effect of different mass flow rates on the PV and thermal efficiency associated with the PVT collector system. Different diameters of the square tube design were modeled and studied to determine the optimum diameter. The results show that the use of the optimal Sq20 mm water-based liquid design improves the PVT electrical efficiency. The electrical and thermal efficiencies of PVTs have been improved through the use of nanofluids. The PVT-Sq-SiC nanofluid achieved an optimal Tpm of 47°C and yielded a PVT electrical efficiency of 13.19%.

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Water quality assessment of six rivers of the Pacific side of Guatemala

G. Calvo-Brenes[1] and **N. Gil-Rodas**[2]
[1]*Instituto Tecnologico de Costa Rica, Costa Rica*
[2]*Universidad de San Carlos, Guatemala*

The seas of Latin America are of great marine richness; however, river contaminants that drains to the seas, the growing human settlements around the coast, overfishing and growing agricultural activity, limit the ecosystem benefits. Guatemala is the most populous country in Central America with 17 million and the agricultural activity has been growing, mainly with monocultures that demand a large amount of water. High human population densities and intensive agricultural land use have negative impacts on the environment. In addition, Guatemala does not have a water quality regulation that allows river water quality monitoring and its effect on the oceans; therefore, the condition of its rivers and its impact on the seas is currently unknown. The objective of this research was to evaluate the quality of several rivers on the Pacific side of Guatemala using Costa Rica's water quality regulations in conjunction with a quality index developed for that nation, based on physicochemical and microbiological indicators (Calvo-TEC's Water Quality Index). It was determined that the rivers sampled for a year showed from moderate to very severe pollution. The main quality indicators that caused such contamination was due to high concentrations in fecal coliforms, phosphates and organic matter load, which vary depending on rainfalls as well as river flow changes.

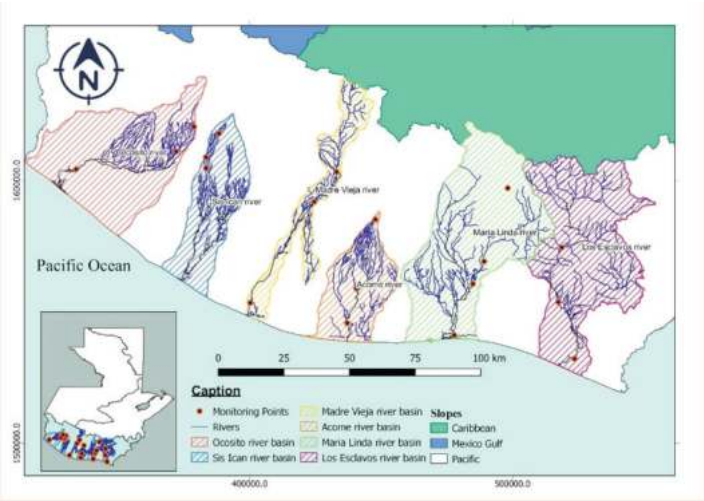

Figure 1. *River location in the Pacific side.*

Table 1. *QWIs of each river according to month and sampling area*

River	Zone	Mes de muestreo 2018			
		March	June	October	December
Acomé	Low	65.9	22.5	26.1	26.4
	Middle	25.7	20.5	26.7	26.4
	High	46.1	63.3	73.9	81.6
María Linda	Low	45.9	18.8	26.1	38.9
	Middle	54.9	18.9	24.8	58.9
	High	61.9	28.5	24.9	50.3
Los Esclavos	Low	39.1	19.6	23.1	61.4
	Middle	58.6	26.2	18.4	25.3
	High	46.1	19.7	25.2	27.9
Madre Vieja	Low	44.6	19.7	26.4	26.4
	Middle	23.9	19.5	26.6	25.8
	High	24.1	19.7	26.1	26.6
Isis Ican	Low	25.9	27.3	26.2	26.2
	Middle	25.8	62.5	27.2	27.0
	High	25.7	27.3	19.6	27.0
Ocosito	Low	61.2	27.2	45.5	45.0
	Middle	62.1	31.2	30.9	31.0
	High	26.4	27.2	19.4	19.6

CONTAMINATION LEVEL:

None	Incipient	Moderade	Severe	Very severe
Class 1	Class 2	Class 3	Class 4	Class 5

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Exergoeconomic evaluation of a banana waste pyrolysis plant for biofuel production

Harvey Andres Milquez-Sanabria[1] and **Dionisio Humberto Malagon-Romero**[2]

[1]*Fundacion Universidad de America, Colombia*

[2]*Universidad Santo Tomas, Colombia*

Health and environmental problems arise in the world due to gases produced during the combustion of fossil fuels. This problem has focused on researching the production of renewable fuels from biomass. One type of biomass is the waste produced during banana cultivation. In this industry, for every ton of banana harvested, there are on average four tons of waste that also pollute the environment. This paper aims to evaluate the economic and exergetic viability of a banana waste pyrolysis plant in Colombia. The plant processes were simulated in Aspen Plus®, which resolved the material and energy balance. The yield of products was validated with experimental results from the literature, where differences could be attributed to biomass composition and reactor type. The results obtained revealed yields of 40.20%, 24.75%, and 35.07% from bio-oil, char, and gas respectively. Additionally, economic and exergy data were combined for an exergy costing method to carry out the exergoeconomic analysis. The overall exergy efficiency of the plant was 61.76%. The highest exergy destruction is in the dryer and the pyrolysis reactor, which account for 35.84% and 32.96%. The combustion chamber has the highest exergy destruction cost (180.19 $/h) and a low value of the exergoeconomic factor (5.96%), indicating that an improvement of the equipment is required, even if it means an increase in investment cost. The study reveals that the analysis made demonstrates the potential of bio-oil production from banana waste, and the possibility of using gaseous products in a combined heat and power plant. The novelty of this paper is the methodology that can be applied to the design of energy generation projects, supported by process simulators, combining economic and exergetic analysis, which are useful in developing countries

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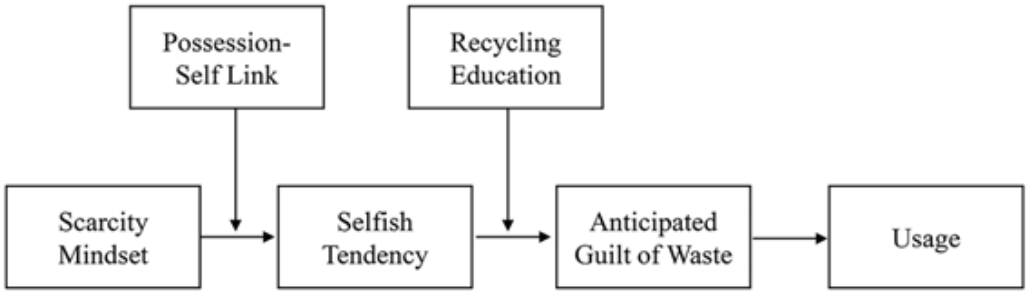
Experiencing less leads to the use of more: The effect of a scarcity mindset on product usage

Honghong Tang, Lin Li and **Song Su**
Business School, Beijing Normal University, China

In social marketing campaigns, demonstrating the severity of scarcity to highlight the importance of reducing wasteful behaviours is a prevalent approach that seems logically justified. However, whether and how a scarcity mindset influences product usage in waste generation remains unclear. The present article reveals the process underlying the effect of a scarcity mindset on product usage with experiments and serial mediation analysis. Five studies demonstrate that reminding consumers of a scarcity experience induces them to be more selfishly oriented and to experience less anticipated guilt of waste, thereby increasing their usage amount. In Study 1, we found that reminding consumers about their experiences with scarcity led them to be more self-oriented and increased their product usage. Study 2 showed the role of serial mediators, i.e., a selfish tendency and anticipated guilt of waste, in the enhancement of a scarcity mindset on usage. Study 3A and 3B found that enhancing the possession–self link with ownership increased the anticipated guilt of waste and decreased usage after priming a scarcity mindset. Study 4 suggested that recycling education about the classification of recyclable and unrecyclable waste increased consumers' anticipated guilt of waste and undermined the effect of a scarcity mindset on increasing product usage. This research thus advances our understanding of the factors that affect consumption quantity and sheds light on waste prevention and reduction.



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The carbon footprint of government fleet vehicles in South Africa – case study

I O ELIMI[1,2] and **GH Stoffberg**[2]

[1]*Infinity Safety Health and Environment, South Africa*
[2]*University of South Africa (UNISA), South Africa*

The Intergovernmental Panel on Climate Change (IPCC) has concluded that climate change is caused by human activities. This case study presents findings on the vehicle use by the Department of Health in Ekurhuleni, Gauteng province, South Africa. The objectives of this study are to estimate the carbon dioxide equivalent emissions of government fleet vehicles and to identify mitigation measures to reduce the vehicle carbon emissions. Both the World Resource Institute Greenhouse Gas Protocol (GHGP) and the United Kingdom Department of Environmental Forestry and Rural Affairs (DEFRA) methodologies were used. The study revealed that the government fleet vehicles emitted 1362 t CO2e for a five year period (2010 -2014), which is equivalent to $ 9 071 of the South African carbon tax (Table 1). Various measures to reduce CO2e emissions were recommended, money saving from fuel and potential revenue generating opportunities were identified, including the use of hybrid vehicles.

Years	t CO_2e current vehicles	Carbon Tax ($6.66 per t CO_2e
2010	252	$1 678
2011	328	$2 184
2012	277	$1 845
2013	222	$1 479
2014	283	$1 885
Total	1362	$9 071

Table 1 *Carbon Tax Implication on the Government Fleet Vehicles Total CO2e Emission*

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Climate change in cold regions - how to adapt infrastructure?

Irina Chesnokova[1] and **Dmitrii Sergeev**[2]

[1]*Water Problems Institute, Russian Academy of Sciences, Russia*
[2]*Institute of Environmental Geosciences, Russian Academy of Sciences, Russia*

The process of adaptation to climate change is extremely relevant for the Arctic: warming here occurs twice as fast as in other regions of the planet. The results of many assessments show that this trend will continue in the long run. Extreme natural phenomena become a threat to the security, health and well-being of the Arctic regions and are associated with risks for economic activity in the polar regions, affecting the development of natural resources, sea and land transport, serving infrastructure, buildings and structures, housing and communal services and agriculture. Adaptation is becoming not only one of the new priorities of the agenda for sustainable development at the national and international levels, but also an everyday challenge for the cold regions.

Regional and microclimatic features of climate change have led to a different response of the temperature regime of permafrost in different cold regions of Russia, including the sectors and landscapes of the Arctic. Climatic changes in the Arctic are proceeding at a fairly high rate. To assess the risks of changes in the Arctic systems, an assessment of the current and future state of permafrost is of particular importance.

The apparent trends in average annual ground temperatures are different at different depths. This is due to the multidirectional influence of climatic factors and territorial differences in the depth distribution of temperatures in rocks. Temperature trends at different depths are used in conjunction with the time indicators of the onset of geocryological events to draw up the climate adaptation programs. Adaptation is planned at three main levels. At the national level, zoning is carried out according to the predicted timing of the permanent transformation of geocryological conditions. At the regional level the facilities and responsible companies must be determined. At the local level the engineering protection programs must be developed for each facility under construction or in operation. These programs are based on local geocryological forecast data, in which the input data are the results of a previously performed national level forecast. This makes it possible to take into account the background influence of climatic changes and separate these changes from the influence of the engineering structures.

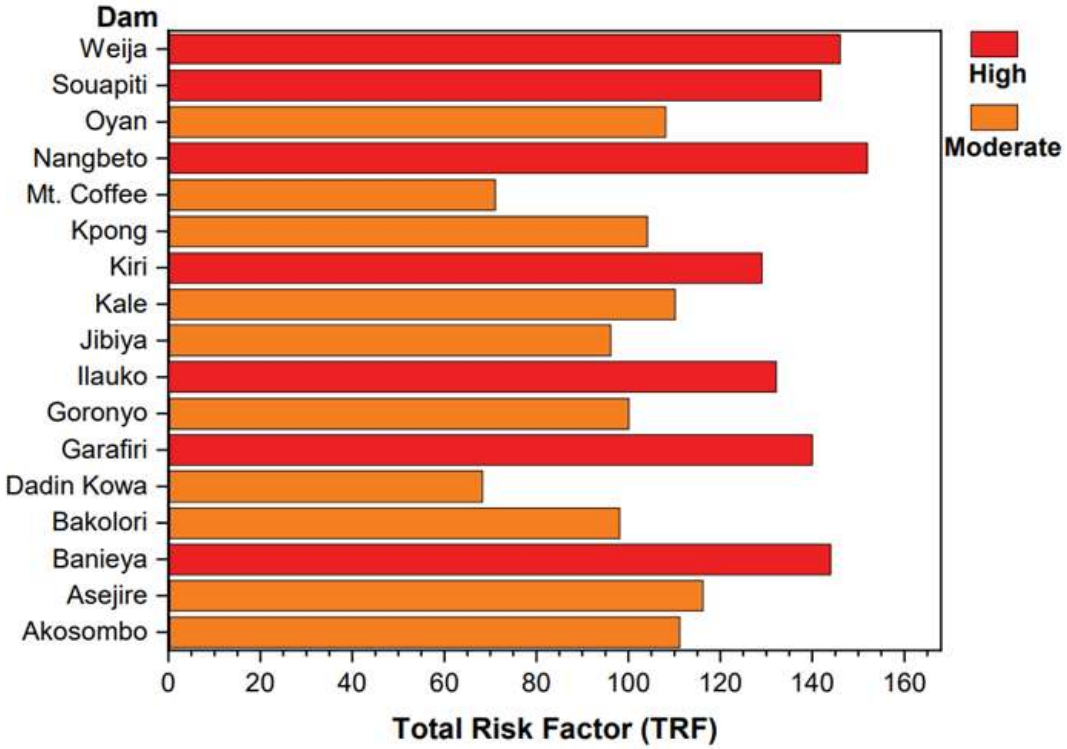
Adaptation is implemented in the form of special programs for improving management at the national and regional levels and in the form of special programs for engineering protection at the local level. The presented approach to the use of small-scale modeling data in local models makes it possible to take into account the influence of background climate change and separate these changes from the influence of an engineering structure.

This work was carried out under the themes (State registration numbers 122022400105-9 and FMWZ-2022-0001) of the State assignment of the WPI RAS and IEG RAS.

Seismic risk analysis for large dams in West Africa region

S. A. Irinyemi, D. Lombardi and **A. M. Syed**
University of Manchester, UK

Dams are critical infrastructures, the failure of which would cause a catastrophic effect on a regional scale. West Africa has more than 150 large dams across the region, constructed in strategic locations which pose a potential risk for people and properties at the downstream paths. A method of seismic risk analysis for large dams within the West Africa region based on Bureau (2003) method is discussed to evaluate the seismic hazard rating at the dam sites and the risk rating of its appurtenant structures. Although the study region is considered as a stable continental, two major earthquakes with casualty figures have been reported in Ghana and Guinea areas of the study basins in 1939 and 1983, respectively. This paper summarizes the procedures for analyses



seismic risk and explain the seismic hazards of seventeen large dams selected within the study basins, based mostly on the significance of each dam and location of earthquakes in and around the dam sites. The results show the values of peak ground acceleration (PGA) at dam sites ranges from 0.02 g to 0.45 g. A hazard map of PGA indicating preliminary analysis of dam structures was developed for the study basins. Based on the results of these analyses, 59% of the analysed dams identified as high-risk dams, while the rest dams fall within the moderate-risk class (Figure 1). These dams require further analyses for their safety to protect the populace and the built environments along the downstream paths

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Assessment of hydro-climatic variables and its impact on river flow regime in the sub-basins of the Upper Indus Basin

Jamal Hassan Ougahi[1], Sajjad Saeed[2,3] and **Khairul Hasan[4]**

[1]Department of Geography, School of Social Sciences, UK

[2]Earth System Physics Section, The Abdus Salam International Center for Theoretical Physics (ICTP), Italy

[3]Department of Earth and Environmental Sciences, University of Leuven (KU Leuven), Belgium

[4]Department of Civil Engineering, The University of Memphis, USA

The assessment of hydro-climatic variables plays a key role to examine long-term changes in snow-fed and glacier-fed rivers that are vulnerable to climatic variations in areas of complex geography. This study investigated monthly, annual and seasonal variability of three major elements in the water system, temperature, precipitation and streamflow changes to determine their relationships, using Terra climate, a high-resolution regional climate modeling product and in situ river discharge data in the Upper Indus Basin (UIB). Long-term (1960-2017) trends and magnitudinal changes in hydro-climatic variables were determined by applying modified Mann-Kendall and Sen's slope test. The spatial variations in climate variables show significant trends that are strongly regulated by the altitude. Overall, warming trends are greater in spring and higher with elevation. The temperature trends show significant increase in maximum temperature (Tmax) during autumn (0.09 ☐C/decade), spring (0.22 ☐C/decade) and winter (0.12 ☐C/decade), while decrease in summer (-0.07 ☐C/decade). A significant decrease Tmax was observed in the Hunza and Jhelum sub-basins which indicate a suspected pattern of summer cooling over the period. Tmax exhibited large spatio-temporal variations with respect to high (e.g., Hunza and Shyok) and low (e.g., Jhelum and Kabul) altitude sub-basins, in contrast to more homogenous patterns of trends in minimum temperature (Tmin) across the whole UIB. River discharge from high-altitude sub-basins was positively correlated with temperature, while in low-altitude sub-basins with precipitation. A clear trend in annual and seasonal variations in hydro-climatic variables from the snow-fed and glacier-fed sub-basins could be a response to climatic factors.

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Modelling and evaluation of the seismic capacity of typical Brick URM buildings of the historical center of Cuenca Ecuador

Jose Calderón-Brito and **Juan Jiménez-Pacheco**
Department of Engineering, University of Cuenca, Red Sísmica del Austro, Ecuador

The Historic Center of Cuenca (HCC) is located in the southern region of Ecuador. It is well known that our country is located on the so-called belt of fire of the Pacific Ocean, this area is characterized by having generated the most important seismic events in the history of mankind. More specifically, there are records that show that in the last 200 years the city of Cuenca has been exposed to earthquakes that have produced moderate to severe damage. These reasons make it possible to establish that the city of Cuenca and specifically its historic center could present important problems in the face of significant seismic events. Most of the buildings in the HCC date back to the middle of the 20th century and have used unreinforced brick masonry (brick-URM) to build their walls. This work is part of the Seismic Vulnerability Project: Seismic Damage Scenarios of the Built Heritage of the Historic Center of Cuenca. In the context of this vulnerability project, the objective of this work was to establish a family of pushover curves for three unreinforced brick masonry buildings typical of the HCC, based on a parametric pushover analysis. The definition of the typical buildings was based on an extensive work of architectural and geometric characterization of the traditional built heritage of HCC. On the basis of focusing the study on two-story buildings (the most common), the size of the floor area of the buildings (small, medium and large area) was assumed as a base parameter. Based on an analysis of the variability of different geometric and mechanical characteristics, and in order to study their influence on the pushover curves of the three typical brick URM buildings, the following study parameters were defined: 1) compressive strength of brick masonry y 2) wall thickness. The pushover analysis was carried out with the Ruaumoko program. The model of the buildings responds to an equivalent portal frame macro-model scheme that has been formulated and validated by the authors of this paper. The results will be discussed in terms of the incidence of the variability of the study parameters on the basic characteristics of the pushover curves. These results will be an essential input for the next stage of the project consisting of damage estimation for different levels of seismic action expected in the city.

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Strategies and measures for typhoon-related disaster risk reduction under public emergencies in TC region

Jinping Liu[1], Jixin Yu[1] and **Youngkwang Choi[2]**
[1]ESCAP/WMO Typhoon Committee Secretariat, China
[2]Pusan National University, Republic of Korea

The unexpectedly outbreak of COVID-19 in early 2020, as a public emergency, has impacted the way of human behavior deeply and widely in today's society, including the countermeasures of typhoon-related disaster risk reduction and preparedness in the Members of Typhoon Committee (TC). This paper briefed the impacts due to COVID-19 pandemic on activities of the Committee in 2020; introduced the countermeasures took in National Hydrological and Meteorological Services (NHMS) of TC Members during typhoon season in 2020 for coping with the crisis caused by COVID-19 pandemic; summarized the innovative strategies and countermeasures for dealing with the crisis of special or emergency public situation for typhoon-related disaster risk prevention, preparedness and reduction in future based on the review and analysis of the experiences from Members and international/regional agencies, and the outcomes from TC Integrated Workshop and Annual Session, including strengthening meteorological and hydrological services and value of preparedness; enhancing multi-sectoral coordination mechanisms; promoting the mobile- based data transmission and information dissemination; and increasing installation of home- based hydro-meteorological monitoring stations. The paper also discussed the impact-based forecasting and the application of big-data and AI technology in typhoon-related disaster risk reduction as two new key areas to be taken into consideration in TC updating Strategic Plan 2022e2026.

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Influence of rainfall infiltration on the stability of unsaturated coal gangue accumulated slope

Kaleem Ullah Jan Khan[1], Wang Chang-ming[1], Muhammad Wasim Jan Khan[2], Liang Zhu[1], Li Shuo[1] and **Li Bai-long[1]**

[1]College of Construction Engineering, Jilin University, China
[2]Department of Management Sciences, University College of Zhob, Pakistan

The slope instability is associated with increasing rate of rainfall infiltration which cause shear strength reduction and suction loss and the slope tend to failure. The influences of rainfall infiltration on the stability of clayey and sandy slopes have been analysed but the effect of rainfall infiltration on the stability of unsaturated coal gangue accumulated slope was needed to study. Therefore, a coal gangue accumulated slope prone to failure in Fuxin area of Northeast China was considered to evaluate its failure mechanism under different rainfall events. The effects after five different rainfall events on slope stability were physically analysed, numerically investigated and the results from both uncoupled (hydraulic) and coupled (hydromechanical) responses were compared using finite element analysis. It was observed that the decisive soaking and leaching under different rainfall conditions caused maximum deformation at the crest of slope due to maximum value of permeability coefficient of coal gangue. The critical duration of moderate intensity (147 mm/day) of rainfall for the instability of coal gangue accumulated slope is declared as five days. The results from finite element analysis in this paper further clarifies that increase in duration of rainfall infiltration process causes hysteretic change in positive pore-water pressure causing decrease in factor of safety and increase in deformation. It is concluded that the stability of unsaturated coal gangue accumulated slope is greatly influence by the coupled effect of stress and porewater pressure in comparison of uncoupled (hydraulic) analysis as the obtained factor of safety values after five days of rainfall infiltration were 0.9 and 1.1 respectively.

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Phytoremediation as a promising approach for reusing wastewater

Karzan M. Khalid[1] and **Dilshad G. A. Ganjo**[2]

[1]*Soran University, Iraq*

[2]*Salahaddin University, Iraq*

An excessive concentration of metals is toxic to plants, animals and humans. The present study focuses on the efficacy of three local emergent aquatic plants; Veronica anagallis-aquatica L.; Mentha longifolia L. (Hudson) and Cyperus iria L. and one free-floating; Nasturtium officinale R. Br. for removal of metals (Fe, Pb, Zn, Cu, Mn, and Ni) from the main wastewater channel of Soran City. Outdoor sand pot experiments were conducted in-situ and the selected macrophytes were applied. At the end of experiment, the macrophytes were harvested and prepared for heavy metal analysis using ICP-MS. The particular mechanisms of phytoremediation were investigated. The selected plants adapted and properly grew, as determined by their high biomass production and survival rate. Emergent plants (V. anagallis-aquatica and C. iria) accumulated high quantities of Fe, Cu, Ni, and Mn in roots (bio-accumulation factor for roots, BAFroot >1 and translocation factor, TF 1000 mg/plant root), BAFs > 1, and TF < 1, and the revealed mechanism was phytostabilization. Mentha longifolia accumulated similar patterns of Zn in shoots and roots (BAFs >1 and TF >1), the involved mechanism was phytoextraction. Free-floating N. officinale showed the highest percentage of metal uptake and removal capacity for Pb (60% and 10 mg/d/g, respectively). Synergetic and plant genetic abilities need to be optimized to develop commercially useful practices.

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Solid-state anaerobic co-digestion of organic fraction of municipal waste and sawdust: Impact of co-digestion ratio, inoculum-to-substrate ratio, and total solids

Kasra Pourrostami Niavol[3], Fazel Ziaee[1] and **Nader Mokhtarani[2]**
[1,2]Civil and Environmental Engineering Faculty, Tarbiat Modares University, Iran
[3]Department of Civil and Environmental Engineering, Temple University, USA

The world's population has increased over the last few decades, leading to a rise in municipal solid waste (MSW). Municipal solid waste contains mainly organic wastes that can be a good source for anaerobic digestion. Solid-state anaerobic digestion is an affordable and suitable technique to mitigate the organic fraction of municipal solid waste (OFMSW). However, as the organic loading of OFMSW is high, co-digestion with other materials can improve the system's performance. This study aimed to investigate the performance of the co-digestion of OFMSW and sawdust and study the parameters affecting its performance. Based on the experiments, the optimum sawdust/OFMSW ratio was achieved 1:2 with the methane production of 0.3 L/g VS. In addition, the inoculum-to-substrate ration (I/S) was investigated at 1:4, 1:2, 1:1, 2:1 ratios. The best result was obtained at 2:1 ratio with a total methane yield of 0.28 L/g VS. The results also indicated that I/S ratios less than 1:1 led to fatty acid accumulation and acidic pH condition. The effect of total solids content on the co-digestion process was also examined in this study. According to the results, as the total solids increased, the biomethane yield decreased while the biogas content increased.

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Survival models induced by zero-modified power series discrete frailty: Application with a melanoma dataset

Katy C. Molina[1,2], Vinicius F. Calsavara[3,4], Vera D. Tomazella[2] and **Eder A. Milani[5]**

[1]*Institute of Mathematics and Computer Sciences, University of São Paulo, Brazil*
[2]*Department of Statistics, Federal University of São Carlos, Brazil*
[3]*Department of Epidemiology and Statistics, A.C.Camargo Center, Brazil*
[4]*Biostatistics and Bioinformatics Research Center, Cedars-Sinai Medical Center, USA*
[5]*Institute of Mathematics and Statistics, Federal University of Goiás, Brazil*

Survival models with a frailty term are presented as an extension of Cox's proportional hazard model, in which a random effect is introduced in the hazard function in a multiplicative form with the aim of modeling the unobserved heterogeneity in the population. The frailty term is a non-negative variable that indicates the frailty of the unit and it represents the information that can not be or has not been observed as environmental factor, genetic factor, or other information that for some reason was not considered in the planning of the study. Candidates for the frailty distribution are assumed to be continuous and non-negative. However, this assumption may not be true in some situations, it is appropriate to consider discretely-distributed frailty, for example, when heterogeneity in lifetimes arises because of the presence of a random number of flaws in a unit or because of exposure to damage on a random number of occasions. In this paper, we consider a discretely-distributed frailty model that allows units with zero frailty, that is, it can be interpreted as having long-term survivors. We propose a new discrete frailty-induced survival model with a Zero-Modified Power Series family, which can be zero-inflated or zero-deflated depending on the parameter value. Parameter estimation was obtained using the maximum likelihood method, and the performance of the proposed models was performed by different Monte Carlo simulation studies in which different scenarios were analyzed for the parameter p. Finally, the applicability of the proposed models was illustrated with a real melanoma cancer dataset.

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Preparation and characterization of hybrids of cellulose acetate membranes blended with polysulfone and embedded with silica for Copper (II), Iron (II) and Zinc (II) removal from contaminated solutions

Kayembe J. Diainabo and **Nomcebo H. Mthombeni**
University of South Africa, South Africa

With the objective to assess the suitability of cellulose acetate (CA), polysulfone (PSF) and silica (SiO 2) for wastewater treatment, this work presents the results of preparation and characterization of PSF blended CA hybrid filtration membranes (CA/PSF) as well as PSF blended and SiO 2 embedded CA hybrid adsorption membranes (CA/PSF-SiO 2) for copper (II), iron (II) and zinc (II) ions removal from contaminated aqueous solutions. The membranes were prepared by phase inversion, using granules of CA, PSF and SiO 2 dissolved in N, N Dimethyl formamide (DMF). From the scanning electron microscopy (SEM) used to determine the morphology of the membranes, different pore sizes are seen at their rough surfaces and cross sections. The porosity and pore sizes of the membranes, determined by differentiation varied from 26.8±0.3 to 81.1±0.3 µm and 1.26 to 1.38%, respectively. The contact angles of the membranes ranged between 49 and 76° on their glass side while their ranged between 56 and 77° on their air side. The hybrid filtration polymer membranes allowed the uptake of more than 90% of the metal ions initially present in the contaminated solutions which were concentrated at 40 mg L -1. Adsorption experiments were carried out with CA/PSF-SiO 2 membranes. The adsorption capacity of these compounds was shown to be higher than numerous other literatureknown adsorbents, reaching 70 mg g -1 for CA/PSF 85/15-SiO 2 towards Cu (II). Finally, by coupling adsorption with ultrafiltration in the tangential mode, the removal of Cu (II), Fe (II) and Zn (II) was found to be improved, allowing to reach a removal efficiency of 95% towards Cu (II) at a metal concentration of 60 mg L -1, and a promising removal efficiency around 98% at a very high metal concentration of 900 mg L-1.

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Using Central Composite Face Design (CCFD) and Response Surface Methodology (RSM) systems to develop and optimize a sewage wastewater treatment program

L. Obidike and **E. Madigoe**
University of the Witwatersrand, South Africa

The increasing demand for fresh water due to the ever-increasing world population has compelled scientist to find ways to recycle wastewater to increase the supply of fresh water. The presence of organic matters and solids which have adverse effects on the wastewater have necessitated that a simpler and more efficient purification method is developed for faster response to the demand. The coagulation-flocculation process is one of the most efficient and simple chemical treatment processes for wastewater. Its mechanism involves the aggregation of suspended solid particles into settleable flocs by charge neutralization of colloids which had kept the particles apart. Iron and aluminium salts are mostly used to neutralize the colloids to form larger flocs which can be separated from the liquid phase by sedimentation or filtration. In developing and optimizing a wastewater treatment program for the treatment of sewage wastewater, Central Composite Face Design (CCFD) and Response Surface Methodology (RSM) were utilized to develop the experimental design, establish the relationship between the independent variables - the coagulant and flocculant dosages, and the responses - the turbidity and the total dissolved solids removal. The optimal dosages for the coagulant (120.9 ppm of U6750) and the flocculant (125 ppm of Floc887) yielded optimal removal efficiencies of 93.3% and 23.2% for turbidity and TDS, respectively. This shows that the developed treatment using the coagulant, U6750, and the flocculant, Floc887, improved the physical characteristics of the wastewater.

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Effects of heavy isotopes (2H1 and 18O16) depleted water consumption on physical recovery and metabolic/ immunological parameters of healthy volunteers under regular fitness load

L. Korkina[2], C. De Luca[1], W. Mayer[1] and **I. Trakhtman[2]**
[1]MEDENA AG, Switzerland
[2]SWISS DEKOTRA GmbH, Switzerland

Water depleted of heavy isotopes, such as $^{2}H_{1}$ and $^{18}O_{16}$ (HIDW), has shown numerous biological/health effects in vitro, in vivo, and in epidemiological studies. Major observations were related to cell growth/differentiation, immune/ nervous system responses, endurance/ adaptation, mitochondrial electron transfer, energy production, glucose metabolism, etc. No human studies to confirm physiological, metabolic, and immune responses to the consumption of HIDW have been performed. A placebo-controlled study on healthy volunteers (n = 50) under fitness load who consumed 1.5 L HIDW (58 ppm ^{2}H and 1780 ppm ^{18}O) or normal water for 60 days was carried out. Plasma content of $^{2}H_{1}$ and $^{18}O_{16}$, markers of energy, lipid, and glucose metabolism, anthropometric, cardio-vascular, oxidant/ antioxidant, and immunological parameters were determined. Significant decrease in plasma heavy isotopes in the group consuming HIDW was observed in concomitance with an increase in ATP insulin, and LDH and diminished plasma lactate. Several anthropometric and cardio-vascular parameters were improved as compared to placebo group. Lipid markers demonstrated anti-atherogenic effects, while oxidant/antioxidant parameters revealed HIDW-induced hormesis. Antibacterial/ antiviral immunity was remarkably higher in HIDW versus placebo group.

Conclusions: HIDW consumption by humans under fitness load could be a valid approach to improve their adaptation/recovery through several mechanisms.

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Kelyphite rims on garnets of mantle xenoliths from kimberlite pipes

L. Pokhilenko

V.S. Sobolev Institute of Geology and Mineralogy, Siberian Branch of the Russian Academy of Sciences, Russia

Kelyphitic rims are present on garnets from xenoliths of various parageneses: peridotites (enriched and depleted), eclogites, pyrpoxenites, and polymictic breccias. Xenoliths of the mantle section under the Udachnaya-East and Noyabrskaya kimberlite pipes (Yakutia, Russia) were studied. Five types of rims are identified: Rim1 develops between garnet and olivine/pyroxene (or rim2) and is composed of high-alumina pyroxenes, spinel, phlogopite; rim2, the coarse grain part of rim1, is located between rim1 and olivine/pyroxene, and mainly consists of phlogopite and less aluminous larger pyroxenes and spinel; rim3 develops between garnet and kimberlite, and presents with phlogopite and Fe-Ti spinel; rim4 sometimes presents instead of rim1/rim2 and consists of zoned high-Cr phlogopite with rare fine grains of chromium spinel; rim5, a "pocket" between garnet and rim1, is represented by microcrystalline aggregates of clinopyroxene, mica, spinel, calcite, and feldspar in different variations. Rim formation occurs due to tectonic movements causing rock cracking and system decompression. Metasomatic melts enriched with water, alkalis, chlorine etc., penetrating microcracks, interact with garnet and form kelyphite Rim1/2. Various variants of the reactions depend on the chemical composition of initial garnet and acting fluid/melt. The transformation of the primary rims to form Rim3 occurs when xenoliths interact with the kimberlite melt. Rims 1, 2 are typical for garnets of all studied parageneses. Rim3 is not observed on garnets from pyroxenite and polymictic breccia. Rims 4 and 5 develop on high-Cr subcalcic garnets of the most depleted peridotites. Each type of kelyphite demonstrates a clear enrichment with a certain component: Rim1—MgO and alkalis; rim2—TiO2; rim3—FeO and TiO2; rim4—Cr2O3; and rim5—CaO, suggesting the multistage injection of different components by mantle fluid.

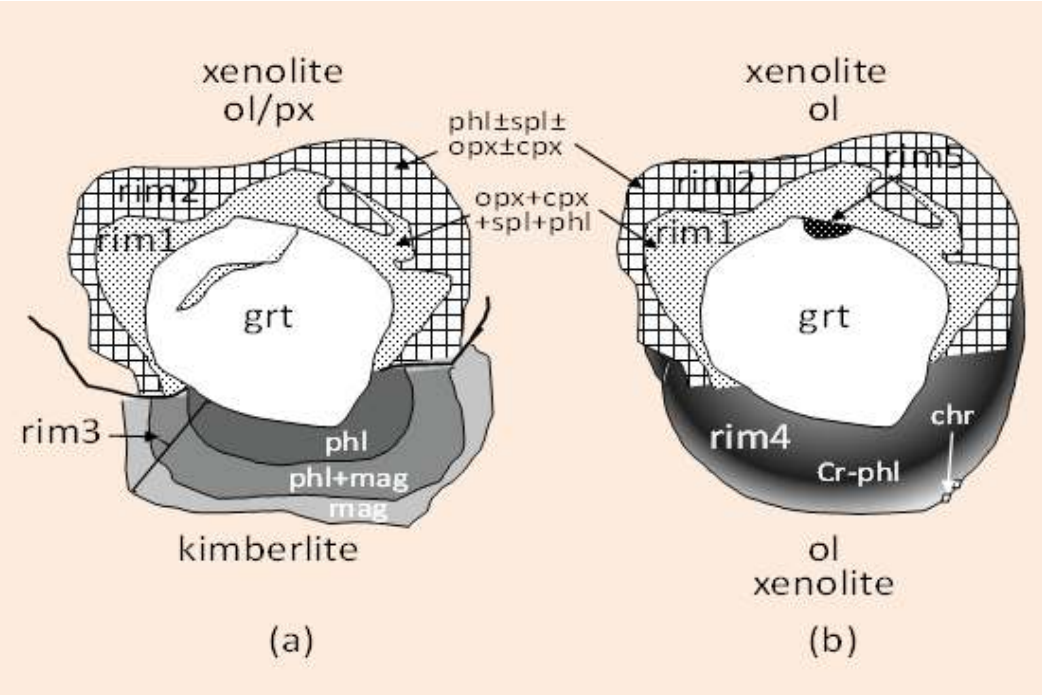

Figure 1. *Scheme of the kelyphite rim types, locations, and compositions: (a) Rims 1, 2 and 3 surrounding garnets of peridotites (enriched and depleted), pyroxenite, polymictic breccia or eclogites; (b) rims 4 and 5 surrounding garnets of the most depleted peridotites*

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The use of geotechnologies for the identification of the urban flora in the city of Teresina, Brazil

Marcelo Ribeiro Mesquita[1], Shivani Agarwal[2], Leonardo Henrique Guedes de Morais Lima[3], Maria Regiane Araujo Soares[4], Diogo Brunno e Silva Barbosa[4], Vladimir Costa Silva[5], Guilherme Loureiro Werneck[6,7] and **Carlos Henrique Nery Costa[8]**

[1]Campus Parnaíba, Instituto Federal Do Piauí, Brazil
[2]Ashoka Trust for Research in Ecology and the Environment, India
[3]Campus Helvídio Nunes de Barros, Universidade Federal Do Piauí, Brazil
[4]Campus Amílcar Ferreira Sobral, Universidade Federal Do Piauí, Brazil
[5]Campus Amílcar Ferreira Sobral, Universidade Federal Do Piauí, Brazil
[6]Instituto de Medicina Social, Universidade Do Estado Do Rio de Janeiro, Brazil
[8]Departamento de Medicina Comunitária, Universidade Federal Do Piauí, Brazil

Urban greenness is an element of vital importance for the population quality of life, and forest inventory is considered the most appropriate method for its assessment. Remote sensing has become an attractive alternative for the accomplishment of forest inventory, facilitating urban fora mapping. The present study aimed to identify the main species of trees in Teresina, Piauí, and evaluate the botanical identifcation accuracy by using high-resolution satellite images (Worldview-2) as compared to on-site inventory. We used the e-Cognition 8.7 software for the mapping, segmentation, and classifcation of the vegetal species and ERDAS Imagine 9.2 for accuracy verifcation. The NDVI (Normalized Diference Vegetation Index) was used to analyze the natural vegetation condition. The outskirts of the city presented higher values of NDVI. An amount of 1,392 individuals from 53 species and 28 families, were identifed. Among these, the families Anacardiaceae (20.7%), Fabaceae (19.8%), Meliaceae (9.4%), Myrtaceae (6.9%), Arecaceae (6.1%), and Combretaceae (5.5%) were the most prevalent. Amongst the 53 species identifed, the 16 most abundant were chosen for the analysis. The classifcation had a satisfactory result for the 16 vegetal species with a general classifcation accuracy of 69.43% and a kappa agreement index of 0,68. The species that obtained the highest accuracy were Ficus benjamin (87,5%),

Terminalia cattapa (83,3%), Syzygium malaccense (82,4%), Mangifera indica (76,8%), Caesalpinia ferrea (75,9%), Pachira aquatica (73,9%), and Tabebuia sp (75,9%). The results showed that it is feasible, although challenging, to classify biodiverse vegetation in an urban environment using highresolution satellite images. Our fndings support the use of geotechnologies for inventorying urban forest in tropical cities.

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Extent of degradation in three stage co-composting of faecal sludge and solid waste

Md. Alamin[1,2] and **Quazi Hamidul Bari**[2]

[1]*Graduate School of Natural Science and Technology, Kanazawa University, Japan*

[2]*Dept. of Civil Engineering, Khulna University of Engineering & Technology (KUET), Bangladesh*

Co-composting of Faecal Sludge (FS) and Solid Waste (SW) allows recycling of essential nutrients into agriculture thereby closing the nutrient circle. In this study, temperature variation, the mass balance of forced and passively aeration on composting process, and the extent of degradation with different stages were investigated. The extent of degradation was determined through the different composting process in the first, second and third stage with different mix proportion of Faecal Sludge. Four sets of the initial waste mixture were prepared using SW and FS. SW and FS were mixed at four different ratios for four sets namely 90:10, 85:15, 80:20, and 75:25 (SW: FS). Forced aeration and passively aeration composting tests were done using series of reactors as described above according to a planned experimental program. The results show that (i) the mean maximum temperature of the first and second stage were 65 oC and 56 oC of passively, 67 oC and 60 oC of forced aeration respectively which raised within 7 days. (ii) According to the mass balance, total mass, moisture content, and volatile solids were always decreased at every stage for passive and forced aeration process, the degradation of the volatile solid in composting process using forced aeration was more than passively aeration process. (iii) For the passively and forced aeration process, the total BVS degradation of were ranged between 82 % to 89 %, and 73% to 91% respectively after 60 days. Therefore, it can be concluded that the percentage of BVS degradation in forced and passively aeration was not significantly different.

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A study of employment issues and challenges of Pakistani migrants in Malaysia

Mohd Na'eim Ajis, Nor Azizah Zainal, Zermina Tasleem
School of Government, Universiti Utara Malaysia, Malaysia

The influx of foreigners into Malaysia has occurred since before independence. At that time policies and legislation related to migration especially those involving foreign workers were less systematic. As of 2018, most of the registered foreign workers are among neighboring countries in the Southeast Asian and South Asian region such as Indonesia (713, 925), Bangladesh (544. 652), Nepal (346, 313), India (120, 978) and Pakistan (62,627) which ventures into various fields such as construction, plantation, agriculture, manufacturing and services. Although, the number of Pakistani workers is not as much as workers from other countries of the South Asian region, but the United Nation (UN) in 2017 has reported Pakistan is the second highest sending country of low-skilled workers to Southeast Asia especially to Malaysia. Therefore, this research was conducted to study the participation of Pakistani workers in the employment sector in Malaysia. In addition, it also aims to study the difficulties and challenges faced by Pakistani workers working in Malaysia. This research is a qualitative study, where data collection is carried out through by two methods, namely primary and secondary data. Primary data were obtained from interviews conducted with authorities and Pakistani workers. Meanwhile, secondary data were obtained from library surveys, annual reports and statistics related to the foreign workers especially from Pakistan. The result of the study found that in the aspect of work experience is divided into two perceptions, namely those who work in the professional and high skills category, and those who work in the semi -skilled and unskilled categories. Professionals consider the work environment to be good and very conducive while working in Malaysia. But on the other hand, those involved in 3D jobs argue that there is discriminatory treatment perpetrated by both employers and co -workers in the workplace. In addition, respondents also face language communication problems in the workplace and it has caused some employees to be less motivated while working. However, some respondents consider the language issue not a barrier and they can still interact as far as they can understand. Some of them also took initiative to learn the local language so that they can communicate with local workers. The latter is related to remittance, where the results show that not all workers are able to send money back to Pakistan because it depends on economic activity, salary earned and the attitude of saving money by the employee.

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A framework to evaluate the institutional effectiveness of national climate financing mechanisms

M. Sheriffdeen[1], D.R. Nurrochmat[2], Perdinan[3] and **M. Di Gregorio[4]**

[1]Graduate Program of Natural Resource and Environmental Management, IPB University Bogor, Indonesia

[2]Department of Forest Management, Faculty of Forestry and Environment, IPB University Bogor, Indonesia

[3]Department of Geophysics and Meteorology, Faculty of Mathematics and Natural Sciences, IPB University Bogor, Indonesia

[4]Sustainability Research Institute, School of Earth and Environment, University of Leeds, UK

Over the past few decades, tackling climate change has persistently featured in international discussions, with the main issues centering on mobilizing adequate global response and effectively coordinating and channeling this response at the sub-national levels. In order to effectively mobilize and harmonize resources to address climate change at country level, the idea of establishing national climate finance institutions (NCFIs) with the duty to mobilize, manage and allocate funds to implement climate change actions has gained prominence among developing countries. This study develops an indicator-based framework to evaluate the institutional effectiveness of the Indonesian Climate Change Trust Fund (ICCTF) as a case study. Building on previous frameworks and principles of climate finance, a total of 21 indicators were identified, these indicators were categorized into five effectiveness components, which are: legal and regulatory framework, fund mobilization and sustainability, fund management and allocation, monitoring and evaluation, and transparency and accountability. We find that the major and fundamental weakness of the ICCTF is its inability to adequately mobilize funds, while its strength is in management and allocation of available resources. Inclusion of the legal and regulatory framework component, which has been largely absent in previous studies, further enabled us to identify critical legal gaps in the operationalization of the ICCTF. While the current legal foundation of the ICCTF ensures transparency and accountability, it significantly constrains the ICCTFs flexibility and innovative potentials.

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Wheat production in the highlands of Eastern Ethiopia: Opportunities, challenges and coping strategies of rust diseases

Mulu Nigus[1,2], Hussein Shimelis[1], IsacK. Mathew[1] and **Seltene Abady[2]**

[1]African Centre for Crop Improvement, School of Agricultural, Earth and Environmental Sciences, University of KwaZulu-Natal, South Africa

[2]School of Plant Sciences, Haramaya University, Ethiopia

Ethiopia is the primary wheat producer in Sub-Saharan Africa (SSA) owing to the suitable agro-ecological conditions. Despite wheats economic potential for food security, the actual yield under smallholder farmers' condition is low due to various production constraints. Knowledge of production constraints and farmer-preferred traits is essential for priority setting and formulation of plant breeding objectives. Thus, the objectives of this study were to assess the present wheat production opportunities and constraints and identify farmer-preferred traits to guide variety design with stem rust resistance and economic traits in eastern Ethiopia. Data on production constraints and trait preferences were collected using structured questionnaires involving 144 wheat-producing farmers. Wheat rust (reported by 97.3% of respondents), small land size (90.4%) and a lack of improved varieties (75.6%) were identified as the major constraints. About 41.7% of respondents in the West-Hararghe and 27.8% in the East-Hararghe zones did not use crop protection strategies to control rusts. Substantial respondent farmers used cultural practices (18.8%), rust-resistant cultivars (13.2%) or, a combination of these (10.4%) to control rust diseases. The essential farmer preferred traits in a wheat variety were rust resistance, high yield potential and good quality grain for bread making. Therefore, there is a need to breed new varieties with high grain yield and quality and durable rust resistance for sustainable wheat production in eastern Ethiopia.

Table 1: *Major wheat production constraints and proportion of farmers who reported these (%) in East-and West-Haraghe zones.*

Constraints	No of farmers	EH							WH							*P value*
		Score					RBQ	R	Score					RBQ	R	
		1	2	3	4	5			1	2	3	4	5			
Diseases (rusts)	72	60	11	1	0	0	98.2	1	56	7	8	1	0	96.4	1	0.06
Shortage of arable land	72	59	7	2	0	0	92.9	2	54	8	4	1	0	90.4	2	0.586
Shortage of improved variety	72	19	26	8	8	2	77.2	3	14	17	14	19	1	75.6	3	0.061
High cost of inorganic fertilizer	72	13	16	13	14	1	66.9	4	14	22	17	6	0	71.7	4	0.228
Shortage of inorganic fertilizer	72	8	15	15	18	2	65.7	5	7	24	11	17	2	70.1	5	0.611
Poor supply of seeds	72	11	19	14	10	1	65.1	6	8	14	11	22	4	65.6	6	0.140
Poor attributes of the current improved variety	72	9	17	14	12	1	61.8	7	1	10	5	31	1	50.4	10	0.000
Poor soil fertility	72	5	11	19	11	1	53.3	8	1	9	16	30	4	62.9	7	0.016
Low yield	72	8	11	13	12	2	52.6	9	2	11	6	31	0	53.3	9	0.003
Moister stress	72	5	10	11	4	5	39.7	10	4	11	7	24	5	54.6	8	0.013

EH, East-Hararghe; WH, West-Hararghe; A score of 1 denotes very important and 5 less important production constraints, RBQ, Rank Based Quotient; R, rank; P-values according to the Kruskal Wallis Test.

Table 2: *Farmer-preferred traits in a wheat variety in Ethiopia's West- and East-Hararghe zones during 2018.*

Traits	Zones				t	*P* value
	EH (N = 72)		WH (N = 72)			
	Mean	Rank	Mean	Rank		
Yield potential	1.43	1	1.30	1	1.127	0.262
Bread making quality	3.38	3	2.90	3	1.893	0.063
Early maturity	3.62	4	3.46	5	0.707	0.482
Drought tolerance	3.79	6	3.45	4	1.125	0.267
Insect pest resistance	3.75	5	4.25	8	-1.128	0.281
Disease resistance	1.94	2	2.06	2	-0.940	0.349
High market value	3.82	7	3.73	6	0.393	0.696
Environmental adaptability	4.40	9	4.25	8	0.882	0.382
Good biomass	4.00	8	4.10	7	-0.250	0.806
White seed color	4.00	8	4.75	11	-0.728	0.588
Big seed size	4.44	10	4.62	10	-0.572	0.580
Good crop stand	4.75	11	4.46	9	0.965	0.345

EH, East-Hararghe; WH, West-Hararghe; N, number of respondents; Rank numbers of 1 to 11 indicates for farmer-preferred traits of 1 is high preference and 11 low preferences.

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One-pot and isothermal protocol for CO2 Capture and Utilization (CCU) by a New Dual Functional Materials (DFM)

N.G. Khaligh

Nanotechnology and Catalysis Research Center, Institute for Advanced Studies (IAS), University of Malaya, Malaysia

Recently, issues of efficiency and environmental impact have become causes of serious global concern in the industry. Due to the CO2 accumulation and the rising demand of energy, the development of sustainable energy technologies and reduction of carbon dioxide in the atmosphere via CO2 capture, storage, and utilization (CCSU) are the two important and effective strategies in dealing with current environmental issues viz. reduce greenhouse gas emissions and associated climate change.

This project focuses on the synthesis DFMs as a promising catalytic solution for the development of sustainable energy technology and capture and conversion of CO2 to high-value products. The CO2 is captured from a flue gas and catalytically converted to synthetic natural gas (i.e., CH4) using H2 generated from renewable source on the DFM. The stored H2 used for methanation is assumed to be afforded by water electrolysis using excess alternative wind or solar energy.

The primary commercial target of this project will be focused on power plant exhaust gases containing molecular oxygen and steam, as well as fermentation, landfill, and cement manufacturing effluents where O2 and steam are absent. Therefore, an aging test consisting of the cyclic test using CO2/N2 and a simulated O2-and-steam-containing flue gas for the adsorption will be conducted in 10 g scaled up the reactor with DFM pellets instead of DFM powders and cycle tested in a larger scale fixed bed reactor. DFM pellets are more consistent with industrial processes since fine powdered materials have high-pressure drop and create operational, technical and health problems for workers.

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Synergy between climate risk perception, adaptation responses, and agricultural productivity: The case of rice farming communities in Pakistan

Nasir Abbas Khan, Zaiwu Gong and **Ashfaq Ahmad Shah**

Research Center of Risk Management and Emergency Decision-Making, School of Management Science and Engineering, Nanjing University of Information Science & Technology, China

The climate variability in Pakistan adversely affects rice crops and undermines the food security and livelihoods of millions of rural households whose survival depends directly on rice farming. This study examines farmers' risk perception, adaptation responses, and adaptation impact on rice productivity. We employed a multi-stage sampling method for selecting 480 farmers from the rice production zone of Punjab province, a region that produces more than 60% of the total rice in the country and faces significant production decline due to climate change. We used the risk matrix method to determine farmers' perception of climate change-induced risk and used the propensity score matching (PSM) technique to analyze the impact of adaptation measures on rice yield and crop returns. Results show that farmers had high perceptions and were concerned about biologi- cal and financial risks, followed by biophysical, atmospheric, and social risks. Farmers applied supplementary irrigation, changed rice cultivation dates, changed rice varieties, resized farms, and altered irrigation application times as adaptation measures to cope with changing climate effects. Probit regression analysis showed that the adaptation measures had been largely affected by farmers' socioeconomic attributes and risk perceptions. The PSM estimates showed that all adaptation measures had a positive impact on rice yield and crop return. Specifically, the cultivation of alternative rice varieties, farm resizing, and supplementary irrigation were the most effective strategies, followed by the adjustment in cultivation dates and irrigation time. Having implications beyond Pakistan, this study suggests improving farmers' access to irrigation water, credit, and farm advisory services to facilitate the extent of adaptation.

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Different increasing trends of air and sea surface temperatures at small islands (Adriatic Sea, Croatia)

O. Bonacci
Split University, Faculty of Civil Engineering, Architecture and Geodesy, Croatia

An island is defined as a land mass on all sides surrounded by water. As a consequence of being separated from the continental land mass, each island represents a climatologically and hydrologically restricted unit with exclusively local water balance. According to the UNESCO definition, in the hydrological sense, small islands are smaller than 1000 km2, while very small ones are those whose area is less than 100 km2. Within Croatia's territorial Adriatic Sea waters, there are 79 islands, 525 islets, and 642 rocks, and rocks awash, which cover the area of 3195.71 km2, 62.41 km2, and 1.44 km2, respectively. In the Mediterranean Sea there are about 10.000 islands, approximately 250 of which are inhabited. Their social stability and the ecosystem sustainability are faced with climate change, especially global warming. The objective of this paper is to assess the differences in behaviour of air and sea surface temperatures variability and trends, at annual and monthly time scales, in different small and very small Adriatic Sea islands: (1) Krk; (2) Hvar; (3) Vis; (4) Biševo; (5) Lastovo; (6) Korčula; (7) Palagruža. General conclusion is that it is not only the island location that is important for heat regime formation, but also its size, height, geological setting and vegetation cover.

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Identification of bird taxon based on structural analysis of feather material

O. L. Silaeva, O. F. Chernova and **A. N. Varaksin**
Severtsov Institute of Ecology and Evolution, Russia

The purpose of the study is to identify the bird taxon from the remains of feathers. Identification studies are in demand in ornithology, zoology, molting, environmental education, bionics (design of silent aircraft, etc.), ethnography and anthropology. The studies of feather material are needed also in aviation ornithology, archeology, paleontology, paleobiology, environmental ecology and forensic science. On the basis of microstructural study of the feather cover of birds, phylogenetic constructions are made. The peculiarities of the feather structure indicate also the phylogenetic relationship of different taxa, as well as population and intraspecific variability. Using mathematical methods (clustering according to morphometric data of microstructure feather elements), phylogenetic connections between taxa of the highest and middle rank are determined.

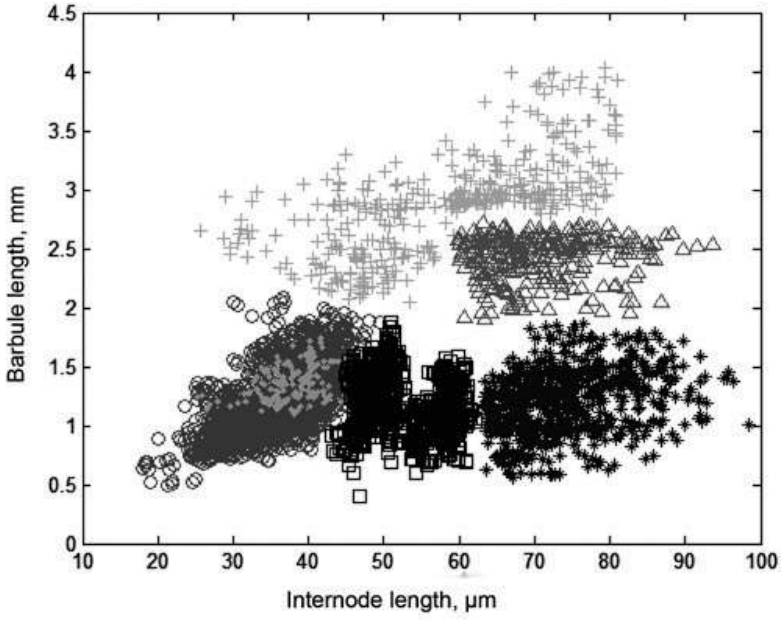

Fig. 1. *Visualization of orders in the space of two uncorrelated informative features. Anseriformes, *; Galliformes, +; Charadriiformes, □, ; Columbiformes, Δ; Piciformes,☐; Passeriformes,☐.*

To minimize bird strikes it is necessary to determine the type of collision participant. The complex systems created at our Institute for species determination of birds by feather remains (feathers, single feather or its fragments) allow to process large amounts of data. The structural method has a number of advantages over molecular genetic analysis; primarily it is less time and money for identification expertise. There is also a drawback: not always the amount of feather material allows you to determine a bird species, that is, a low-ranking taxon.

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Geochemical evaluation of atmospheric particulate matter (PM_{10}) in Central Brazil

Poliana Dutra Maia[1], Marcelo Vieira-Filho[2], Luciana Figueiredo Prado[3,4], Luca Correia Martins da Silva[5], Fernando Fabriz Sodré[5], Henrique dos Santos Vicentini Ribeiro[5] and **Roberto Santos Ventura[4]**

[1]Faculdade UnB Planaltina, Universidade de Brasília (UNB), Área Universitaria n. 1-Vila Nossa Senhora de Fátima Planaltina, Brazil

[2]Departamento de Engenharia Ambiental (DAM), Universidade Federal de Lavras (UFLA), Brazil

[3]Instituto Oceanográfico, Universidade de São Paulo (USP), Praça do Oceanográfico, Cidade Universitária, Brazil

[4]Instituto de Geociências, Universidade de Brasília (UNB), Brazil

[5]Instituto de Química, Universidade de Brasília (UNB), Brazil

We characterized the PM10 in Distrito Federal, Central Brazil, which is a region close to agricultural areas, neighboring the Amazon Forest, and impacted by biomass burning. We quantified the water-soluble ions (Na+, K+, Mg2+, Ca2+, Cl-, NO3-, SO42-), elements (Al, Ba, Cu, P, Zn), total carbon, 13C isotope and evaluated its morphology from January 2018 to September 2019. PM10 sampled at three stations (Fercal - cement industry zone; Rodoviária

– bus station with busy traffic ways; and Zoo – background area) were collected by High-Vol collectors (1 m3 min-1/24h of flow) and analyzed by IC, ICP-AES, and SEM-EDS. For the whole sampling campaign and station, the descending mean ions concentrations (in ng.m-3) were: Ca2+ > SO42- > Na+ > NO3- > Cl- > K+ > Mg2+. The main water-soluble elements (in pg.m-3) were: Al > Ba > Zn. The maximum values of all chemical variables were registered during the dry season, mainly in the Fercal and Rodoviária stations where the total carbon correlated with PM10 mass. The δ13C values, ranging from -19.60 to -24.12‰ at the Zoo and Rodoviária stations, are closer to burning δ13C values of C3 plants of Cerrado vegetation.

According to the factor analysis, biomass burning sources in the dry season (May to September) could explain 31% of the total variance in the particulate matter water-soluble chemical composition. Crystallized minerals of Ca and Si oxides were related to natural sources and the cement industry. Biological particles and some spherical ones composed of

C, N, O, Si, and Ca with adsorbed transition metals (Ni, Cu, and Zn) were associated with the origin of pollen, spores, plants, or animal traces. Currently, we are studying the PM10 dispersion by backward trajectories, quantifying Sm, Nd, and Sr isotopes and the magnetic properties of that PM10 samples to untangle the atmospheric sources.

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Optimum planting configuration for alfalfa production with ridge-furrow rainwater harvesting in a semiarid region of China

Dengkui Zhang Qi Wang
College of Grassland Science, Gansu Agricultural University, China

Soil desiccation is a major challenge faced by subsistence farmers growing alfalfa (Medicago sativa L) in consecutive cultivation in semiarid regions. We hypothesized that alfalfa fodder yield would increase with the length of growing season, growing degree-days, and rainfall. A field experiment was conducted on alfalfa production from 2012 to 2016 to 1) determine the response of fodder yield to rainfall, the length of growing season, and accumulated growing degree day (AGDD) in different growing-cutting stage (GCS)s; 2) obtain the suitable mulching material and the optimum ridge width for ridges with manually compacted soil (MCS), mulched with bio-degradable film (BF), and plastic film (PF). There were 10 treatments (3 ridge widths × 3 ridge-mulching materials + flat planting (FP) as control) with three replications laid in a randomized block design. The ratio of the first GCS to the second GCS in fodder yield ranged from 1.10 to 4.55, which was similar to the ratio of the first GCS to the third GCS in fodder yield ranged from 1.14 to 4.59, although rainfall, the length of growing season, and AGDD were different during the two or three GCSs. The highest fodder yield was obtained from the first GCS in one year and reached the highest level in the second growing year, and maintained a similar level in the subsequent years, although rainfall, the length of growing season, and AGDD varied during the five year periods. Fodder yield was affected by both the rainfall in the GCS and the available soil moisture prior to the GCS. Compared to FP, the increase of evapotranspiration for MCS, BF, and PF was 11, 61, and 63 mm, respectively. Fodder yield for BF and PF increased by 28% and 33%, respectively. Fodder yield for MCS maintained the same level as that for FP. Evapotranspiration increased and fodder yield decreased as ridge width increased. The optimum ridge width for MCS, BF, and PF was 29, 39, and 37 cm, respectively, across five years. Future study should focus on alfalfa-crop rotation to mitigate soil desiccation after alfalfa consecutively production.

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Dealing with stabilization and sustainability issues in emergency reconstruction projects (Iraq as a case study)

Rasha A Waheeb[1] and **Kusay A wheib**[2]
[1]*Norwegian University of Science and Technology, Norway*
[2]*Baghdad University, Iraq*

Purpose: This study aimed to identify the Sustainability that is a broad and complex concept, which has grown to be one of the major issues in the building industry.

Design/methodology/approach: This study discusses the idea of sustainability involves enhancing the quality of life, allowing people to live in a healthy environment, with improved social, economic and environmental conditions in post-disaster area.

a methodological approach for sustainable reconstruction mostly depending on survey at the beginning to study the case and know more about it, then to assess damage and look for what is available as materials putting the consideration environmental variations, local practices, skills, and how vulnerable and wide is the case to start with.

Findings: The most important delay factors identified leading to schedule overruns were contractor failure, redesigning of designs/ plans and change orders, security issues, selection of low-price bids, weather factors, and owner failures, external factors like change climate. Some of these are quite in line with findings from similar studies in other countries/regions, but some are unique to the Iraqi project sample, such as security issues and low-price bid selection.

Originality/value: We selected ANN's analysis first because ANN's was rarely used in project management, and never been used in Iraq to finding solutions for problems in construction industry. Also, this methodology can be used in complicated problems when there is no interpretation or solution for a problem. In some cases, statistical analysis was conducted and in some cases the problem is not following a linear equation or there was a weak correlation, thus we suggested using the ANN's because it is used for nonlinear problems to find the relationship between input and output data and that was really supportive.

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Land degradation assessment using AHP and GIS-based modelling in Duhok District, Kurdistan Region, Iraq

Rebar Tahseen Mzuri[1], Yaseen T. Mustafa[2] and **Abdulla Amir Omar[1]**

[1]*Department of Geology, Salahaddin University, Iraq*

[2]*Department of Environmental Sciences, University of Zakho, Iraq*

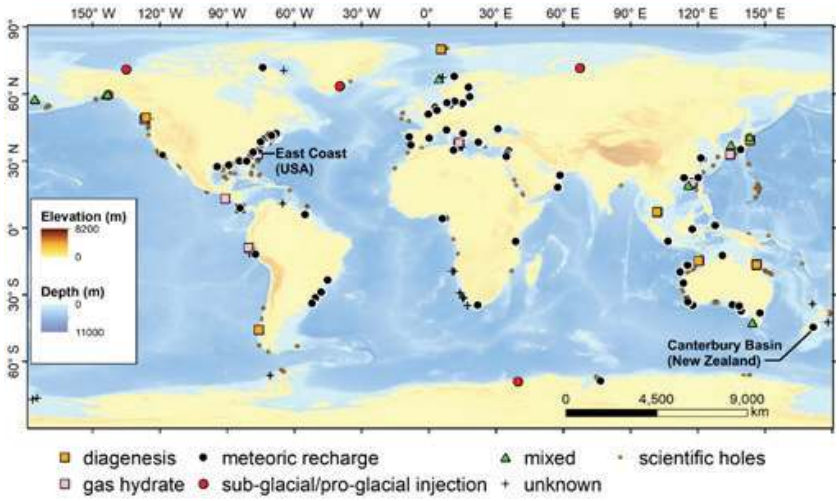
Land degradation is a complex process and significant environmental problem affected by both natural and anthropogenic driving factors. Globally, the prevention of land degradation has become one of the most significant challenges of the twenty-first century. Over the last decade, a marked change was observed in land degradation in the Duhok district of Iraq. Geographic Information System (GIS), Multispectral Remote Sensing satellite image, and Analytic Hierarchy Process are efficient tools for modelling and assessing the risks of land degradation. To analyze land degradation, in this study, various physical and human-induced factors were used in the GIS environment; slope, elevation, drainage, precipitation, geology, vegetation coverage, and land use/ land cover. The data were analyzed and weights assigned to each factor using the analytic hierarchy process and mapped using GIS techniques, resulting in a land degradation map. Field observations were carried out to better understand the degree of various factors that contribute to land degradation by using recent technologies and a global positioning system in the study area. The results show that 11.74% and 28.69% of the study area were affected by high and moderate levels of land degradation, respectively, while 34.77% and 24.79% of the study area experienced slight and no degradation, respectively. Slope gradient, rainfall, and distribution of vegetation were identified as the primary causes of land degradation in the area. This method of evaluation is intended to be beneficial to governments and researchers.

Offshore freshwater: A resource to address water scarcity

Renée Martin-Nagle
A Ripple Effect, USA

Many people are not aware that vast quantities of freshened groundwater lie untapped in continental shelves around the world. Primarily emplaced during the last glacial maximum when sea levels were much lower, offshore freshened groundwater (OFG) is freshest close to shore and more brackish further from the coastline. Due to the timing of emplacement, OFG reserves are not deep and thus could be accessed fairly easily through conventional drilling or pipelines from shore.

The pace of climate change is increasing, and its impact on the hydrological cycle is producing more extreme droughts and water scarcity. As human populations surge, more water will be required for basic needs and for agriculture, and new sources of freshwater will have to be secured. While the current low cost of land-based freshwater serves as a disincentive to invest in the necessary infrastructure to extract, treat and distribute offshore freshwater, coastal cities parched by climate changes and possessing nearby OFG reserves may be willing to make the required capital investments. At that time, questions regarding rights to ownership and utilization of the water will doubtless be raised.



The objectives of this presentation are to inform listeners about the existence and nature of OFG and to explain how existing governance rules will apply to a new resource. The presentation will summarize the results of scientific sampling and modelling and the applicable governance regimes before concluding that development of OFG will begin in the near future, that the UN Convention on the Law of the Sea will determine ownership rights for coastal nations, and that rights to transboundary reserves will probably follow the pattern of joint development crafted by the hydrocarbon industry.

Components of a workable net-zero greenhouse gas emission standard

RT Louw
Promethium Carbon Johannesburg, South Africa

The global business environment saw a move towards setting net-zero targets during 2021. Many large corporates have made public net-zero commitments in the absence of a workable standard that can objectively measure the quality of the commitment, and the progress made towards meeting the commitment. This paper covers some of the aspects required for such a workable standard.

The analysis presented in the paper is done in the context that many of the foundational concepts in greenhouse gas accounting, mitigation management and emission reduction target setting were developed in the early 2000's, and are in need of revision in order to remain useful tools in the current global decarbonisation attempts.

This paper deals with the critical issues of the role of concepts such as baseline setting, indirect emissions, and avoided emissions in target setting. The work on baseline setting deals with the growing global trend to ignore the principle of common but differentiated responsibilities (CBDR) and shows how this can be integrated in a target setting system. The work on indirect emissions in greenhouse gas emissions, target setting, and the measurement and reporting against targets deals with the fundamental change in principles in greenhouse gas accounting introduced by the ISO organisation in 2018, and the importance thereof. The work on avoided emissions deals with the use of causal chain analysis to prove avoided emissions, as well as the principles and occurrence in the double counting of emissions in the reporting of the indirect emission categories. The paper also deals with the use of offsets in achieving net-zero commitments.

The conclusion of the paper is that a fundamental re-think of the use of the greenhouse gas accounting and target setting principles of the early 2000's is required if a workable net-zero standard is to be developed.

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Life cycle analysis CO_2e emissions comparison of three forest harvesting systems on intensively managed radiata pine plantations

Rosa M. Alzamora[1,4], Waldo Oviedo[2], Rafael Rubilar[3,4] and **Juan Pedro Elissetche[1,4]**

[1]Departamento de Manejo de Bosques y Medio Ambiente, Universidad de Concepción, Chile
[2]Forestal Anchile Ltda, Chile
[3]Cooperativa de Productividad Forestal, Departamento de Silvicultura, Universidad de Concepción, Chile
[4]Centro Nacional de Excelencia para la Industria de la Madera (CENAMAD), Pontificia Universidad Católica de Chile, Chile

A Life Cycle Analyses (LCA) assessment was evaluated comparing three harvesting systems on intensively managed Pinus radiata (radiata pine) plantations growing in the Biobío Region, Chile. Evaluated systems considered semi-mechanized, mechanized, and tower logging in steep slope forest operations. Our LCA study focused on CO_2e emissions from six harvesting activities: felling, logging, processing, sorting, loading, and transportation, all under the ISO 14040 and ISO 14044 standards. The average and maximum monthly production scenarios were the highest for the semi-mechanized system with 24 and 25.2 kg CO_2e m-3, followed by the tower logging with 23.2 and 24.5 kg CO_2e m-3 and, lastly, the mechanized system with 11 and 12.1 kg CO_2e m-3. Similar to other studies, harvesting phases that contributed the most were logging, loading and transport. Concerning LCA stages, forest equipment operation generated the highest CO_2e level across the three harvesting systems where fuel consumption was the activity that contributed with 76% of CO_2e for the mechanized system, and 50% in the case of the tower logging and semi-mechanized systems. The mechanized system had the highest fuel use efficiency and the lowest CO_2e emissions.

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Cuban plants of ultramafic soils and climatic changes

Rosalina Berazaín Iturralde
Jardín Botánico Nacional Universidad de La Habana, Cuba

Climate changes directly affect the exchange with the environment, modifying the adaptation capacity of individuals, populations and communities. Ultramafic communities are highly specialized ecosystems to the substrate that sustains them. The Cuban ultramafic flora represents approximately 57% the vascular flora with a high degree of endemism. Ultramafic outcrops are distributed throughout Cuba in a north-central band representing 7% of the island's surface, they occur across a range of climatic conditions, and its vegetation is influenced by topography and precipitations. The Cuban ultramafic plants shows a high grade of xeromorphic traits (microphylly, sclerophylly, and spinescence).mainly due of soils which has an effect of equivalent to a reduction of at least 500 mm of annual precipitation, thus the Cuban ultramafic vegetation is characterized by woody xerophytic shrubs, palms, and trees. Fire, grazing and other anthropogenic disturbances convert thorny xeromorphic scrubs into savannas with palms and a dense herbaceous cover; following disturbances, the secondary vegetation is floristically more deficient and physiognomically different from the vegetation that gave rise. The ultramaphic outcrops are "islands within islands" along the main island and this is why they are vulnerable. How the next climate changes could change the floristic composition and structure of the ultramaphic communities in Cuba is the goal of this work.

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Smart cities: A development and implementation based on marketing, place branding and monetization

Sérgio Henrique Monte Santo Andrade[1,2], Richard Lima Veras[1], Vinicius Henrique da Silva Moreira[1] and Carlos Renato Lisboa Francês[2]

[1]Estácio de Sá, Brazil

[2]Federal University of Pará (UFPa), Brazil

The term Smart City has been increasingly widespread, with the premise of continuous improvement of human quality in a given city by implementing intelligent systems to aid public, urban, personal and financial management. For a city to be considered smart, it is technological update must contemplate the Economy, people, government, mobility, environment, and smart way of life. However, most of the time, the governing bodies of these cities are not able to implement the planned technologies due to financial reasons, when having to deal with emergency works or urgent nature. Thus, the purpose of this article is to develop a strategy for the implementation of technologies that promote the smart city, in a chained and structured way, based on the use of marketing and place branding, as facilitators for the implementation of technologies in these cities, promoting recurring financial gains within the scope of public administration, through advertisements, thus alleviating the financial outlay of implementation. Therefore, the application of smart city technologies will no longer be just a cost in the beginning but will become an investment both financially and in the quality of life of its inhabitants.

The proposal for a case study will be directed to the city of Canaã dos Carajás, located in the state of Pará - Brazil. A region that shows rapid growth, but also is still lacking in structural and systemic services, like most cities in the inside of Brazil. The study will provide methods for making city life more attractive and uplifting for it is residents.

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Developing a prototype designing system circuit of the smart ladder drills' technologically invention for physical competency fitness through the maneuverability of body agility testing

T. T. Santiboon[4], J. Singchainara[1], C. Hemara[2] and **S. Butcharoen[3]**

[1]*Kasetsart University, Bangkean Campus, Thailand*

[2]*Thailand National Sports University, Lampang Campus, Thailand*

[3]*Engineering at the National Telecom Public Company Limited, Thailand*

[4]*Curtin University of technology, Australia*

Creating the R&D conceptual method on five steps: problem exploration, innovative design and development, quality analysis, trial, and evaluation to develop of the Intelligent Smart Ladder Drill Prototype (PISLD technologically invention) for physical competency fitness on the maneuverability of body agility testing was designed. The PISLD system circuits consist of Master Control, Sensor Pad, the 433 MHz RF Module, Bluetooth Module, Display Screen (led 7 segment), and Wireless Sensor Pad. Using the 20-item Suitability Smart Ladder Questionnaire (SSLQ) on four scales, each scale consists of five items was assessed to the 30-athletes from Thailand National Sports University, Lampang Campus, Lampang Province in five options. Relational validity was checked with the Criterion-Related Validity method to examine the concurrent validity to analyze the relationship between the effects of the PISLD model training scores and the results of the original smart ladder model training scores were compared. Operation test in five different modes of the types of testing patterns with the practicing processes were tested. The 10-item Skill-Related Fitness Agility Ability (SRFAA) that helps 30-athletes with the PISLD was practiced and trained for their fitness sports' skills. The SSLQ and SRFAA instruments are valid and reliable. The means on four scales of the SSLQ were independent variable and indicated that of the Strongly Suitability level all of four scales. The SRFAA scale was dependent variable, its value depends on changes in the independent variable were associated with simple and multiple correlations, standardized regression weight validity was analyzed that showed off positive correlation significantly. The R2 value indicates that 72% of the variance in athletes' skill-related fitness agility abilities to their PISLD suitability was attributable toward the SSLQ that determines the proportion of variance in the dependent variable that can be explained by the independent variable data had goodness of fit correlations.

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Long-term tendencies and variability of carbon monoxide in the atmosphere of the Moscow Megapolis

Rakitin V.S[1], Elansky N.F[1], Skorokhod A.I[1], Dzhola A.V[1], Rakitina A.V[1], Shilkin A.V[1,2], Kitillova N.S[1] and **Kazakov A.V[1]**

[1]*Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences, Russia*

[2]*Research and Production Association Taifun, Russia*

This report presents the results of a comprehensive analysis of measurements of CO total content (CO TC) at stations of the Obukhov Institute of Atmospheric Physics, Russian Academy of Sciences (IAP RAS), in Moscow and Moscow oblast. Also, CO in-situ data obtained from automated stations of the Mosecomonitoring network, satellite monitoring results and information on the parameters of the atmospheric boundary layer in Moscow and the surrounding regions are analyzed. The long-term variability of CO TC and meteorological parameters is investigated, the carbon monoxide accumulation characteristics in calm days in the atmospheric boundary layer are obtained. A decrease in the average annual values of TC CO in 2000–2018 was found in Moscow (–2.56 ± 0.52%/year) and at the Zvenigorod Scientific Station (ZSS) (–1.15 ± 0.37%/year). However, the rate of decrease in both sites is different in different seasons and periods.

After about 2007–2008, the rate of CO TC reduction decreased at both sites. In 2008–2018, at the ZSS, an increase in CO TC was recorded in the summer and autumn months at a rate of about 0.7%/year. An increase in the wind speed in the atmospheric boundary layer of Moscow in different periods of 2000–2018 at a rate of 0.4–1.6%/year has been determined. At the same time, no statistically significant changes in wind speed were found in Kaluga oblast. The recurrence of calm days in Moscow in 2006–2017 decreased (–7.06 ± 3.96%/year) with a decrease in the anthropogenic part of the CO content in the same period (–6.72 ± 3.48%/year). The results indicate the influence of the climatic (meteorological) factor on air quality in Moscow.

Additionally, some characteristics of air quality and meteorological conditions in Moscow region during COVID-19 pandemic in 2020 in compare with previous years are discussed.

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Express-indication of organic matter deposition in urban stands

V. Telelsnina and **O.Semenyuk**
Lomonosov Moscow State University, Russia

The growth of urban areas makes it relevant to study the characteristics of urban ecosystems, including their role in the storage of atmospheric carbon.

The availability of studying forest litter and the simplicity of estimating parameters makes it possible to obtain information on the state of urban objects in an express mode for the purposes of environmental monitoring and assessment of the deposition of organic matter.

Coniferous, in particular spruce plantations are the most preferred objects of monitoring. The recreational impact on coniferous plantations causes some increase in the intensity of the biological cycle, the indicators of which are the properties of forest litters, such as thickness, reserves, the proportion of detritus and easily decomposable components in the upper horizon of the litter, as well as the ratio of different horizons of the litter in terms of thickness and reserves. In addition, recreation somewhat levels the differentiating influence of the spruce crown. The increase in the intensity of the cycle is apparently associated with both the direct destructive effect on the litter during trampling and the change in the composition of the living ground cover.

The recreational load leads to a significant decrease in the reserves of organic matter in the litter and carbon reserves due to its decomposition, and, accordingly, additional carbon ingress into the atmosphere from urban areas. The carbon loss of terrestrial detritus during recreation is about 20-60 kg/100 m2 compared to undisturbed plantations. Thus, when improving urban landscaping, it is necessary to plan the diversion of transit flows of visitors from the locations of coniferous plantations in order to reduce the recreational load on these ecosystems.

For the rapid assessment of anthropogenic disturbance of the ecosystem, such indicators as the thickness and type of litter, as well as the ratio of the thickness of the upper horizons of the litter and the sum of the thicknesses of the underlying horizons are proposed.

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Experimental modelling of high-Altitude atmospheric discharges in the laboratory

V. Tarasenko, E. Baksht, N. Vinogradov and **D. Sorokin**
Institute of High Current Electronics SB RAS, Russia

The paper is devoted to the study of a pulsed streamer discharge, similar to that in the Earth's upper atmosphere. Two experimental setups providing the formation of ionization waves propagating in one and opposite directions from a region filled with a plasma formed by the different types of discharge in low and average pressures atmospheric air were created. In a physical experiment, the process of propagation of red and blue ionization waves (streamers) was simulated. It was established that the average propagation velocities of fronts of red streamers corresponds to those of red sprites and blue streamers corresponds to those of blue jets. This was shown as a result of spectral studies that at air pressures of 0.08–3 Torr, the radiation color radiation observed visually and captured on an integral photograph from the region of passage of ionization waves is determined by the spectral transitions of the first positive system (FPS) of nitrogen molecules, similar to what occurs for red sprites. In this case, the spectral energy density of radiation in the most intense band of the second positive system (SPS) of the nitrogen molecule with a wavelength of 337.13 nm is an order of magnitude or more higher than that in the most intense band of the FPS with the wavelength of 775.32 nm. The created setups makes it possible to simulate the process of formation of red sprites propagating in opposite directions under laboratory conditions. Using the emission spectra and methods of optical emission spectroscopy (OES), the main parameters of the discharge plasma are estimated.

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Consumer perceptions of Greenwashing: Lessons learned from the fashion sector in the UAE

Vivek Mohan[2] and **Sufia Munir**[1]

[1]*Westford University College, Westford Education Group, UAE*
[2]*Exeed College, Westford Education Group, UAE*

This paper was published in the Asian Journal of Business Ethics on 11th January 2022 and underlined the relevance of the impact of greenwashing on the fashion sector in the United Arab Emirates. The practice of 'greenwashing' may be characterized as the fabrication of green claims by organizations to portray a positive image. Greenwashing has not been examined in the United Arab Emirates, and the fashion sector is considered the second-largest consumer of harmful chemicals, excessive water use, and non-compliant waste management practices behind the oil and gas sector. Using in-depth semi-structured interviews with fast fashion consumers in the UAE, an exploratory qualitative inquiry was conducted with a focus on the 'seven sins of greenwashing' and 'competitive altruism' theories and the consumer perceptions of green claims made by major apparel manufacturing and retail firms in the UAE were investigated. A conceptual framework was developed to better understand the nature of corporate altruistic behaviour and the perceived advantages of green initiatives. The exploratory qualitative inquiry used for this study provided a great opportunity for gathering detailed information on consumer perceptions of greenwashing practices in the UAE. Future research and statistical representation are needed to cross-reference the data and test the framework suggested here.

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Living on the periphery, mobility challenges and transport induced social exclusion in Southlea Park, Harare, Zimbabwe

V. Thebe and **T. W. Chikengezha**
University of Pretoria, South Africa

In most developing countries, the cities have grown dramatically over recent decades, in large part due to natural factors, such as migration. With rapid urban growth, also comes an expansion of the urban into the peri-urban sphere, which in turn, pushes the peri-urban into what was the rural. Using a case study of Southlea Park, a low-income settlement on the southern fringes of Harare in Zimbabwe, it explores the role and contribution of geographical location in the social exclusion of communities in the periphery of the city. To that end, it seeks to answer the question, what are the socio-economic (political) costs of geographical location? Central to this question is the informal character of peri-urban communities, and in particular, how they informality leads to their unrecognised status and, therefore, lack of services. Using a qualitative method of inquiry based on extended visits, participant observations and interviews with residents, it highlights the conditions that contribute to lack of adequate transportation, and thus, creating barriers to mobility of communities in the city's margins. It shows how the social exclusion seemingly induced by transport disadvantage is actually a consequence of geography and cost of location. In Southlea Park, transport exclusion has been necessitated by the distance of the community from the city centre, lack of transport infrastructure, high cost of community and failure by the government to provide alternatives. It argues that the circumstances and struggles of residents in Southlea Park should not be taken in isolation; they are likely to be echoed across peri-urban settings in Zimbabwe, particularly as the economic situation continues to decline. The results, thus, are significant in understanding issues of accessible transportation and social exclusion of peripheral communities, and provides a useful starting point in any policy for periurban localities.

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Community development banks (CDB): a bibliometric analysis of the first 2 decades of scientific production

Paulo Reis Mourão[1] and **Wiliam Retamiro**[2]

[1]*Department of Economics & NIPE, University of Minho, Portugal*

[2]*Federal University of São Carlos-UFSCAR Postgraduate Program in Science, Technology and Society, Brazil*

This paper deals with a bibliometric analysis of 78 publications identified by the main academic search engines as concerning the topic of community development banks (CDB). The CDB phenomenon takes 2 decades, and some cases—such as the Brazilian Banco Palmas—have gained special attention. We tested two major hypotheses: (1) although the Brazilian origin of Banco Palmas, the socioeconomic development of the last 2 decades enlarged the interest of the topic to researchers from different nationalities; and (2) the collected researches focus on the community development and sustainability. The analysis made it possible to identify that in these 20 years, a great diversity of universities and nationalities of researchers have been associated with the focus of this research; in addition, the content analysis carried out on the titles and abstracts reinforces the connection of the CDB to the social economy, to the surrounding communities, and to microcredit.

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A new GMRF self-supervised algorithm applied to SAR image classification

Shasha Ren[1] and **Xiaodong Zhang**[2]
[1]*South China University of Technology, Guangzhou,Guangdong, China*
[2]*West Anhui University, China*

With the global greenhouse effect, the sea surface coverage is increasing year by year, and people's demand for sea surface monitoring is also increasing, SAR technology is currently an important method for sea ice monitoring, and automatic interpretation of SAR sea ice images has become a key technology in this research field. The problems of limited labeled training samples and unknown the number of classes are challenging for SAR sea ice imagery classification.

To handle this,we presents a new GMRF self-supervised algorithm for SAR image. We add a GOF process in the process of estimating GMM parameters by EM algorithm, which can not only dynamically select the best number of significant classes but also provides an initial feature parameter to calculate the MRF minimum energy. After the iterative region label and region growth cycle, iteration is combined with the Mll context model to obtain the best mark of each region. Since the initial feature parameter selection of the MRF is not random, the operation efficiency is also improved while reducing the number of iteration cycles of the algorithm. The experimental results show that this algorithm not only solves the problem of manual input of the number of classes in the unsupervised image classification process, but also provide the better output result graph in terms of detail maintenance than the expert interpretation of the truth map, and we hope that it could support operations and meet the real-time requirements.

Table 1 Comparison experiments with related algorithms

	Newfound (SA%/kappa/Ts)	Beaufort20101021 (SA%/kappa/Ts)	Beaufort20101027 (SA%/kappa/Ts)	Beaufort 201010213 (SA%/kappa/Ts)
Kmeans	65.46/0.30/8	8.87/0.30/0.17	67.53/0.36/1	70.19/0.53/0.38
GMM	66.57/0.45/7	67.66/-0.20/1	32.45/0.26/1	70.89/0.55/0.36
MRF	77.52/– 0.43/913	53.67/0.20/11	30.45/0.15/25	79.76/0.69/22
IRGS	71.05/0.34/3695	66.28/0.34/8	66.66/0.35/19	83.72/0.73/7520
GMRF	82.52/0.43/927	71.89/0.39/8	77.45/0.42/18	86.85/0.80/483

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Impact of awareness programs on environmental knowledge: A case study from Saudi Arabia

Yahya S. Alotibi and **Abdulaziz Dhabiah**
King Saud University, Saudi Arabia

Studying the elements of the environment and sources of its pollution is very important. However, studying the relationship between the environment and people has been overlooked. Therefore, this study highlights the cognitive aspects of the rural people regarding their surrounding environment. The current study mainly aimed at identifying the participation levels of the rural residents in environmental awareness programs and the impact of their participation on their environmental knowledge. A questionnaire was designed to achieve the objectives of the study and collect data. A simple random sample of 270 was chosen to represent the population of the study. A questionnaire was distributed and 219 valid responses were collected (the response rate is 81%). The results showed that the respondents have a high level of knowledge regarding food pollution, and a moderate level of knowledge regarding water pollution. However, their levels of knowledge regarding air and soil were low. Significant positive correlations were found between participation and perceived benefits from awareness activities as independent variables and overall knowledge regarding food and water pollution as dependent variables. also, the study found the most challenges that prevent rural people from participating in environmental awareness activities were "there were not enough local activities and events are organized in remote locations" (72%), (70%), "Awareness activities are lack of promoting" (67%), "don't trust the information being shared" (57%). It was concluded that designing and conducting more awareness activities with a high level of participation helps to disseminate knowledge regarding the environment and how to protect it. The study recommended working on planning and implementing awareness-raising programs and campaigns through the media and those in charge of rural development in the region to raise the level of knowledge in the rural communities.

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Arctic indigenous biological resource utilization and Traditional Chinese Medicine culture integration

LUO Ying[1] and **Lobanov A. A.**[2]

[1]*South China Business College, Guangdong University of Foreign Studies, China*

[2]*Federal State Budgetary Institution National Medical Research Center of Reabilitation and Balneology"of the Ministry of Health of the Russian Federation, Russia*

Arctic creatures are vations with unique and posting powerful attributes because of their extreme living environment. They are more than effective in health care and fighting against senile diseases. Scientists in the Arctic have found in long-term research that traditional Chinese medicine theory and preparation technology can greatly improve the efficacy of the raw materials of Arctic biological resources. In the process of communicating with Arctic scientists, Chinese national medical masters also pay attention to the strong properties of raw materials of Arctic biological resources. The development of Arctic biological resource products is a green, environmental friendly, circular and sustainable economic model, which is in line with the concept of human response to climate change and a supporting field for global innovation and development.

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The effect of experimental process on properties of pure TiO_2 nanostructure for fast NO_2 gas sensor

Youssef Doubi[1,2], Bouchaib Hartiti[1], Maryam Siadat[2], Hicham Labrim[3], Salah Fadili[1], Mounia Tahri, Philippe Thevenin[5] and **Etienne Losson[2]**

[1]LVO-BEEN laboratory, MEEM & DD Group, Hassan II University of Casablanca, Morocco
[2]LCOMS laboratory, University of Lorraine, France
[3]Advanced Systems Engineering Laboratory, National School of Applied Sciences, Ibn Tofaîl University, Morocco
[4]DERS/ CNESTEN Rabat, Morocco
[5]LMOPS laboratory, University of Lorraine, France

In this study, we reported the impact of spray time and substrate temperature on several properties of TiO2 thin layers elaborated by facile and robust Spray Pyrolysis (SP) technique. The TiO2 thin layers were characterized by the following techniques: X-ray diffraction (XRD), Raman Spectroscopy (RS), Scanning electron microscopy (SEM) and UV-visible spectrophotometer (UV-Vis). The XRD results demonstrated the pure Anatase phase of TiO2 thin layers with the preferential direction along <101> direction. The vibration characteristics of TiO2 have been confirmed by Raman vibratory modes located at 143, 396, 518 and 637 cm-1 which certified the formation of a single phase of TiO2 Anatase. The SEM images showed the formation of granular TiO2 layers. The UV-Vis spectrophotometer displayed the semiconducting properties of TiO2 semiconductor, the band gap energy was ranged between 3.10 and 3.30 eV. All parameters investigated in this study confirmed that TiO2 deposited by the inexpensive spray pyrolysis during 25 min at 500°C had the required properties for gas sensing applications and are in good agreement with those reported in the literature. The sensing properties of the elaborated TiO2 thin films to NO2 showed their high suitability to detect this pollutant gas.

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Transport of drop substance in a quiescent, rotating or wavy fluid

Yuli D. Chashechkin
Ishlinsky Institute for Problems in Mechanics RAS, Russia

Drops are involved in processes of various scales – from a local to a global one of climatic scales. High-resolution video recording used to register the drop material transfer in a target fluid at rest, in a compound vortex above rotating disk installed at the bottom of a container, and in the field of running capillary waves. In the quiescent medium, the inflowing drop firstly forms a colored volume in the intrusive mode. A cavity is formed in the center of flow with a delay and push out the colored vortex ring. At high velocities, the spreading drop forms a linear and reticular pattern on the cavity surface. In flow evolution the fibrous structure is repeatedly rearranged [1]. In a rotating fluid, the substance of the drop enters the liquid thickness along the helical lines and forms spiral tongues on the vortex surface. In the field of plane surface waves a drop first spreads as in a medium at rest with the formation of a cavity and a crown covered with colored fibers. Further, the submerging vortex ring and the near-surface vortex dipole are separated from the spot [2]. In all flow components, the dye remains in the form of fine fibers. The formulation and analysis of experiments are carried out in frame of fundamental equations system, taking into account all the mechanisms of the energy transfer [3].

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An efficient CAD system for ALL cell identification from microscopic blood images

Zhana Fidakar Mohammed[1] and **Alan Anwer Abdulla**[2]

[1]*Department of Information Technology, Technical College of Informatic, Sulaimani Polytechnic University, Iraq*

[2]*Department of Information Technology, College of Commerce, University of Sulaimani, Iraq*

Computer-aided diagnosis (CAD) becomes a common tool for identifying diseases, especially various cancers, from medical images. Thus, digital image processing plays a significant role in this research area. This paper concerns with developing an efficient automatic system for the identification of acute lymphoblastic leukemia (ALL) cells. The proposed approach involves two steps. The first step focuses on segmenting the white blood cells (WBCs). In the second step, significant features such as shape, geometrical, statistical, and discrete cosine transform (DCT) are extracted from the segmented cells. Various classification techniques are applied to the extracted features to classify the segmented cells into normal and abnormal cells. The performance of the proposed approach has been evaluated via extensive experiments conducted on the well-known ALL-IDB dataset of microscopic images of blood. The experimental results demonstrate that the proposed approach realizes an accuracy rate 97.45% and outperforms other existing approaches.

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Emerging resistive switching memories for environmentally friendly and disposable computing devices

Z.W. Dlamini[1,2], S. Vallabhapurapu[1] and **V. S. Vallabhapurapu[1]**
[1]University of South Africa, South Africa
[2]Central University of Technology, South Africa

Recently, the lifetime of electronic devices has decreased to just about several months[1]. The disposal of these unused electronics constitutes the steep rising electronic waste (E-waste), which is currently over 50 million tons per year[2]. The solution to this problem lies in the total transformation of the electronics industry and the adoption of "Green electronics" ideas. In this work we present emerging memory devices fabricated using biological materials such as chitosan[3-5] and cow milk as the active layers. These devices are emerging, and thus have better functionality compared to the current memory giants, i.e., dynamic random-access memory (DRAM) and Flash memories. Furthermore, these devices have shown compatibility with on-chip computing (Neuromorphic computing). Our devices were fabricated in electricity- and heat-free processes and have low power consumption prospects. Therefore, they adhere to environmental regulations and green computing ideas.

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Lessons from severe cyclonic storm 'Gaja' for an effective hazard management plan

A. Balasundareshwaran
India

Tropical cyclones are considered the primary hazard in eastern coastal communities of India, resulting in successive fatalities, monetary loss and environmental degradation. Tamil Nadu, the south-eastern coastal State of India on 16 November 2018 was overwhelmed by the Severe Cyclonic Storm (SCS) 'Gaja', which has its impression still after nearly 4 years. This comprehensive research discusses the assessed preparedness of the coastal community; physio-socio-economic-environment impacts; post-phase response and recovery; and various methodologies adopted in the affected six districts of Tamil Nadu. A total of 18 villages were selected based on the land track of the cyclone for field visits and questionnaire survey. Field data, satellite image processing, and review of reports indicated that more than 3/4th of the population, ~ 90 per cent of the built-up areas, and ~ 40 per cent of the vegetation and agricultural crops were severely affected by the SCS. Even though the coastal communities were warned about the cyclone trajectories before and during the cyclone, only 3/4th of them took precautionary measures to mitigate the effects. The Tamil Nadu Government have played a major role in the post-disaster phase in evacuating people to safe shelters, bringing back communication to the affected areas, and have also provided possible compensation to the victims. In addition to the efforts of the government, volunteers have also offered immediate relief to the affected coastal communities. However, even after three and half years of the cyclone, only less than 20 per cent of the affected community has completely recovered from the devastation. The results of this research help to comprehend the different phases of cyclone management, learn from the mistakes and formulate effective hazard management plans in the era of climate change.

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A novel energy-efficient and reliable ACO-based routing protocol for WSN-enabled forest fires detection

A. El Belrhiti El Alaoui[1], N. Moussa[1] and **E. Nurellari[2]**

[1]*Computer Networks and Systems Laboratory, Moulay Ismail University of Meknes, Morocco*

[2]*School of Engineering, University of Lincoln, UK*

We address the problem of energy efficiency and reliability for forest fires monitored by a distributed bandwidth-constrained Wireless Sensor Network (WSN). To improve energy efficiency, data routing is an important approach that is being considered in the context of WSNs. An attractive and widely used method to find the optimal communication paths is the Ant Colony Optimization (ACO) algorithm. However, the traditional ACO-based routing protocols only consider the energy-efficiency while ignoring the overall network reliability (before and after failures) which is critical in the context of WSNs. In addition, the existing protocols are not application-specific (i.e., the parameters cannot be adapted to the application's requirements).

In this paper, we propose a novel Energy-efficient and Reliable ACO-based Routing Protocol (E-RARP) for WSNs. The proposed protocol not only guarantees high quality communication paths in terms of energy efficiency but also ensures the communication reliability. Critical events in delay-intolerant applications (e.g., forest fires detection) require reliable transmission in order to perform reliable decisions and take appropriate actions in a timely fashion. The simulations results reveal that E-RARP outperforms respectively Load Balanced Cluster-based Routing using ACO and Enhanced Ant-based QoS-aware routing protocol for Heterogeneous Wireless Sensor Networks protocols with a significant improvement of 30.55 % in network lifetime and 14.71 % in network response time.

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Design of ring oscillator-based-VCO for a pH-ISFET redout circuit ADC

Abdelkhalak Harrak[1], Salah Eddine Naimi[1], Victor Medina[2], Smail Hassouni[3], Rubén Garvi[2] and **Luis Hernandez Corporales[2]**

[1]ERSETI Laboratory, ENSA Mohammed First University, Morocco

[2]Electronics Technology Department Carlos III University of Madrid, Spain

[3]LISAC Laboratory, Faculty of Sciences Dhar El-Mehraz Sidi Mohamed Ben Abdellah University, Morocco

A VCO-based-ADC by using a ring oscillator for a pH-ISFET readout circuit is described in this paper. The goal is to enhance the performance of measuring a pH. The stability of the proposed readout circuit is ensured with a ring oscillator over a large range of pH changed from 1 to 12 and with a supply voltage of ±3V. The Caprio's quad circuit is used as a pH-ISFET threshold voltage extractor. A schematic description, as well as Verilog-A were used to simulate the circuit using Cadence virtuoso software. The proposed readout circuit was designed in a 65-nm CMOS TSMC technology. For an oscillation frequency of 13 MHz, the sensors are expected to achieve a resolution less than 0.01.

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Synthesis, characterization and evaluation of new composites coagulants polyaluminum chloride - sodium alginate

A-A. El Foulani[1,2], I. Hammoudan[3], F. Byoud[4], J. Jamal-eddine[1] and **B. Lekhlif[2]**

[1]Laboratory of Organic Synthesis, Extraction and Valorisation, Faculty of Sciences Ain Chock, Hassan II University, Morocco

[2]Research Team Hydrogeology, Water Treatment and Climate Change, Environmental Engineering Laboratory, Morocco

[3]Laboratory Physical Chemistry, Faculty of Sciences of Tetouan, University Abdelmalek Essaadi, Morocco

[4]Laboratoire Interface Matériaux Environnement (LIME), Faculté des Sciences Ain Chock, Université Hassan II de Casablanca, Morocco

Composite coagulants of polyaluminum chloride (PAC) and natural polyelectrolytes have attracted considerable attention in recent years due to their outstanding properties in drinking water treatment. However, the selection of polyelectrolytes grafted into PAC and aluminum forms distribution in the coagulant composite are under continuous evaluation and update. This study evaluated the effectiveness of new composite coagulants based on polyaluminum chloride (PAC) and sodium alginate (SA) to remove the colloidal matter from dam water. Optimization of the basicity (OH to Al ratios) and the sodium alginate ratio were performed by experimental design to control aluminum speciation in the composites coagulants. The Al-Ferron timed spectrophotometric method, density Functional Theory (DFT), and FTIR analysis were performed to explore PAC and SA's interaction mechanism. The monitoring of aluminum speciation in the composite coagulant PAC-SA revealed that the basicity and SA ratios in the PAC-SA affected the distribution of aluminum forms (mononuclear Ala, medium polymeric Alb, colloidal, and highly polymeric Alc). The theoretical analysis identified the medium and high aluminum polymer species as the most sensitive species to react with SA. The coagulation performance revealed that the increasing percentage of the SA, and the prevalence of Alb and Alc species over Ala species in the PAC-SA, are beneficial for turbidity and oxidable matter removal. Incorporating biopolymer (SA) into the PAC reduced the concentration of inorganic coagulant consumed and increased the attraction efficiency of suspended pollutants compared to PAC. At an AlCl3 concentration of 10 mg.L-1, the incorporation of PAC (66.6% of basicity) into 20% of SA removed 99.9% of turbidity and 78.67% of oxidizable matter. This study provided new insights into the intramolecular interaction between PAC and SA and its influence on aluminum's speciation in the PAC-SA to increase surface water treatment efficiency.

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Optimizing airport service cars location/allocation using IoT

Abouzar Ramezani
Sayyed Jamaleddin Asadabadi University, Iran

The increase in the world population and the value of time are changing the importance of air transportation. Regarding this, airport managers are looking for a solution to reduce traffic at airports and optimize the performance of service cars at the airport. One of the new possibilities to improve services at airports is the use of the so-called Internet of Things. Incorporation of The Internet of Things into the airport management provides great benefits for airport operators. The most important innovation of this research is developing a spatial model for the dynamic location of the Equipment Parking Area with optimal allocation of airport services using IoT.

One of the most influential services during the preparing aircraft for flight is the P-T service. In this service, the PBT is transported through the service road to the aircraft which is ready for flight and take the aircraft from apron to taxiway.

This problem follows two objective functions. The first objective function is minimizing the number of PBTs, and the second objective function minimizes the total traveled distance by the PBTs.

In this study, an optimization model implemented to location-allocation airport PBTs for departure flights at Imam Khomeini international airport, Iran. For this purpose, coverage and median problem were considered simultaneously as objective functions and their optimization was considered.

According to the proposed model one of the important parameter is distance between aircrafts and service cars. This parameter is calculated, using network analysis and the best allocation is implemented. Figures 1 are shown the process of calculating distances between the service cars and the aircrafts.

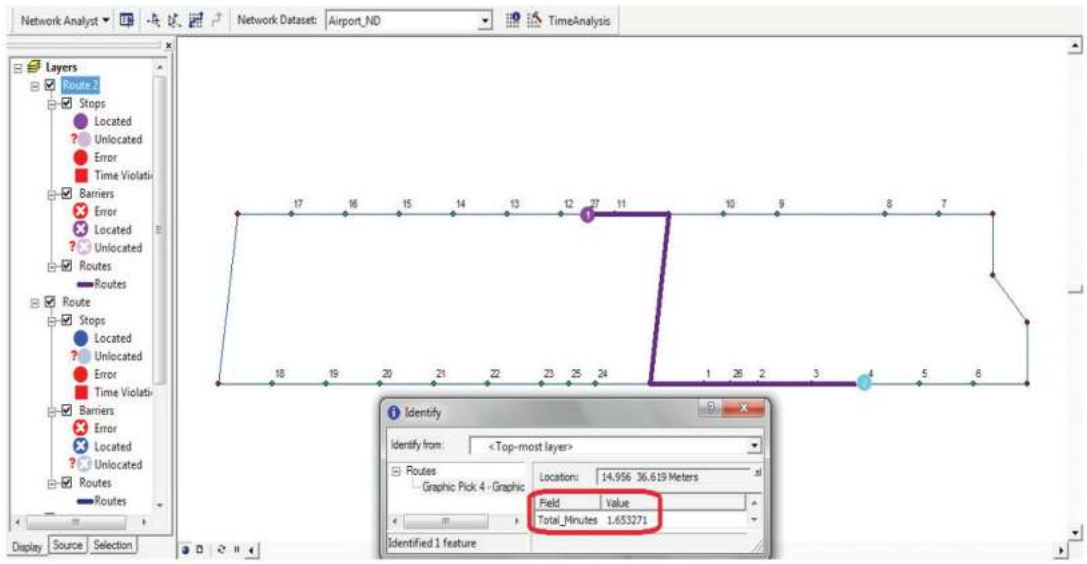

Figure (1): *Calculating distance between station "B" and station "4".*

Numerical results of location allocation from A,B,C stations when the P-T is not returned to the EPA are showed in table (1).

Table 1: *Servicing in the case where the PBT is not returned to the EPA*

Departure time	Distance from aircraft to PBT	P-T Service time(min)	Distance time (sec)	Ready to receive service	Ready to takeoff
14:30	550	7	66	14:15	14:26:30
14:30	250	5	30	14:20	14:28:30
14:35	250	10	30	14:20	14:33:30
14:35	1450	4	174	14:25	14:35
14:45	850	6	102	14:30	14:41
14:55	550	8	66	14:40	14:52:30
14:55	1100	4	132	14:45	14:54:30
15:00	800	9	96	14:45	14:59
15:00	1200	4	144	14:50	14:59:30

Airport managers can use these optimization models to make more efficient and effective planning to use existing facilities and manage them more efficiently. The developed model is general and only by few changes this model could be applied for other airports.

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Messianic breath of soil cyanobacteria to revive the degraded soils in the desert environments

Adel SEPEHR
Dept. of Desert and Arid Zones Management, Ferdowsi University of Mashhad, Iran

Inherent geological characteristics and harsh climatic conditions have brought a rough face to the arid environments, areas with great fragility to environmental perturbations but with extraordinary ecosystems of life. Sodic and saline soils of arid-lands categorized under aridisols and solonchak are the major natural resources of these zones to exhibit a unique fauna and flora, as well as the production, life, and climate system in the environments. In these hyper conditions, a biological microorganism or being from soil microbial communities has been living for billions of years with the name of Cyanobacteria. Susceptible ecosystem and fragile resilience of arid environments cause high vulnerability of aridisols to human activities and climate change. Soil degradation will lead to environmental threats, the extinction of animals and plants, the reduction of biodiversity, water loss, and disruption of water and carbon cycles. Ecological regeneration by native cyanobacteria living at the surface of aridic soils is a biotechnological idea to revive the collapsed soils as they play vital roles in the aridisols by fixing C/N and synthesizing exopolysaccharides, which increase soil fertility and water retention and improve soil structure and stability. This presentation tries to introduce the restoring power of these ecological primers related to revive degraded soils which has provided great hope for the recovery and restoration of degraded ecosystems of Iran, a country with more than 85% arid areas. Inoculation of biological crusts, particularly cyanobacteria, has had positive results on improving soil conditions and restoring degraded soils. the findings have been shown that cyanobacteria by improving the physicochemical parameters of soil such as increasing moisture, nitrogen, and carbon accelerate the establishment of vegetation, increase soil aggregates stability, as well as remediation of saline-alkaline soils, absorption of soil contaminants, and immobilize of heavy metals. On the other hand, pedogenesis, dust capturing, retention of aggregates by secreted exopolysaccharides (EPS) and increasing the amount of soluble nutrients in the soil by producing organic acids are consequences of cyanobacteria inoculation into aridisols that lead to improve soil properties considering biological characteristics that can play an effective role in ecological recovery.

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Dynamic analysis of tall building subjected to six correlated ground motion components

A. Khodaparast[1] and **H.R. Tavakoli**[2]
[1]*Shahid Beheshti University, Iran*
[2]*Babol Noshirvani University of Technology, Iran*

As a building becomes taller, the use of braced frames, or the combination of a frame and shear wall, or bracing, becomes progressively inefficient, such that alternative or complementary solutions, such as an outrigger and belt truss system, become preferable. A 60-story model, which consists of a braced core, and outrigger and belt truss system was assumed at different stories of the structure. A time history analysis was conducted based on the assumption of materials' elastic behavior. The model then was subjected to three- and six-component far-fault ground motions, near-fault ground motions with forward directivity, and near-fault ground motions with a fling step. Complementary studies also investigated the optimum location of the outrigger and belt truss subjected to the ground motions above. The results showed that rotational components can increase the building's response, and this effect is greater in the near-fault motions in particular. Further, the optimum location of the outrigger and belt truss differs somewhat from the results of static analyses conducted previously. The results illustrated that conducting the analysis with six components rather than three has an insignificant effect on the optimum location of the outrigger and belt truss.

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The study of improvement canola physiologic indices under subsurface drainage systems

A. Asgari
Agriculture Jihad Organization of Mazandaran Province, Iran

In order to study the effect of drainage systems on canola growth indices, a field experiment was conducted during 2016-18 growing season at the Sari Agricultural Sciences and Natural Resources University. The treatments consisted of surface drainage (control) and three conventional subsurface drainage systems with 0.90 m and 0.65m drain depths at 15 and 30m spacing (D0.90L30, D0.65L30 and D0.65L15: D and L indicate drain depth and spacing, respectively). Leaf area index and total dry matter were measured randomly from each plot in different growth stages of canola. The traits were then used to determine some physiological indices. Data analysis was performed using SAS software under randomized complete block design. In treatments with subsurface drainage, the maximum LAI and TDW value was more than control. Accordingly, the status of other physiological indices is more appropriate. Generally, results showed that controlling water table has a major role in improving of canola growth physiological indices.

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Effect of silicon dioxide nanoparticles on bacterial pathogens, growth and some biochemical aspects of tomato

A. Parveen
Department of Botany, Aligarh Muslim University, India

The effects of seed priming and foliar spray with silicon dioxide nanoparticles (SiO2 NPs) in two concentrations (0.10 and 0.20 gL−1) was observed on plant growth parameters, total chlorophyll and carotenoid contents, proline and activities of defense enzymes (superoxide dismutase (SOD), catalase (CAT), phenylalanine ammonia lyase (PAL) and ascorbate peroxidase (APX) in tomato with / without bacterial pathogens i.e. Xanthomonas campestris pv. vesicatoria (Xcv), Pectobacterium carotovorum subsp. carotovorum (Pcc) and Ralstonia solanacearum (Rs), under greenhouse conditions. The efficacy of SiO2 NPs solutions (0.10 and 0.20 gL−1) was tested separately against all three bacterial pathogens under in vitro conditions. Concentration of NPs and mode of application were the determining factors for the NPs efficacy in disease suppression and plant growth improvement. Foliar spray was more effective than seed priming in increasing plant growth, total chlorophyll and carotenoid contents, proline and defense enzymes in the presence and absence of bacteria. Foliar spray of 0.20 gL−1 SiO2 NPs caused highest increase in all parameters and maximum reduction in disease indices. In vitro tests by disc diffusion method and scanning electron microscopy revealed antimicrobial nature of SiO2 NPs with varied adverse effects on tested pathogens. Broader inhibition zone (9.26 mm) was formed against Rs followed by Pcc (8.12 mm) and Xcv (7.37 mm). Plants foliar sprayed with 0.20 gL−1 SiO2 NPs showed highest increase in plant growth and biochemical parameters against tested bacteria. Thus, 0.20 gL−1 SiO2 NPs solution can be recommended for the control of these bacterial pathogens.

However, it will be interesting to explore this dose of NPs under field conditions.

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Optical properties of atmospherically relevant aerosols: Instrumentation, measurements and retrieval

S. Aiswarya and **Ravi Varma**
National Institute of Technology Calicut, India

The structure and composition of the atmosphere plays a vital role in balancing the incoming and outgoing solar radiations of our planet. Major pollutants such as trace gases and minute particles suspended in atmosphere, called aerosols, contribute much to this phenomenon affecting the global climate system. The optical properties of aerosols, like extinction coefficient (scattering plus absorption), single scattering albedo (SSA, ratio of scattering to extinction), aerosol optical depth, and Ångström exponent, describe the direct aerosol-radiation interactions. It is challenging to retrieve the broadband optical properties of aerosols due to the spatial and temporal variability of their concentration, their variable size distribution, composition, and mixing, and the limited detection limits of the instrumentation making such measurements. The accurate measurement of complex refractive index (RI = n ± ik), an intensive property of aerosol, is essential for modelling their radiative effects. Along with the knowledge about size distribution and wavelength, RI can be used to perform the forward Mie calculations which results in the accurate retrievals of optical parameters. Conversely, many studies have been conducted to perform the inverse calculations of Mie theory, to retrieve the aerosol complex RI from the optical parameters measured using several instruments, provided the size distribution of the aerosols are known. In this research work, the optical properties of aerosols were retrieved using both experimental and theoretical approaches.

In the first part of this research work, we developed a new instrument exploiting the advantages of a visible-band supercontinuum (SC) light source with those of a dual-cavity cavity enhanced absorption spectrometer (CEAS) setup, which make use of the theory of incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS). This instrument is capable of measuring light extinction by atmospheric aerosol over a broad wavelength range of 420-540 nm, which is important for carbonaceous aerosols. The

newly developed supercontinuum broadband dual-cavity cavity enhanced extinction spectrometer (SC-BD-CEES) was calibrated and tested in the laboratory using absorption of NO2, as well as polydisperse (sodium chloride and kerosene soot) and monodisperse (polystyrene latex spheres) aerosol types. A comparison of both theoretical predictions and experimental measurements with the data obtained from our instrument resulted in good agreements. This study demonstrated that the SC-BD-CEES is a sensitive instrument with sufficient dynamic range and accuracy for laboratory and field applications.

In the second part of this study, we exploited PyMieScatt's survey iteration technique to retrieve the wavelength dependent complex refractive indices of ambient aerosols for the first time. As a primary validation of this method the broadband (420 – 540 nm) refractive indices of common calibration aerosols polystyrene latex (PSL) spheres and sodium chloride (NaCl) were retrieved, from the data collected using a supercontinuum dual-cavity cavity enhanced extinction spectrometer (SC-BD-CEES). Extinction and absorption of light due to ambient aerosols were measured using an incoherent broadband cavity enhanced extinction spectrometer (IBBCEES) and an aethalometer. The refractive indices in a wavelength range from 410 – 550 nm, at two different aerosol loading conditions were retrieved. The data measured on June 23rd 2019 from a location in the Yangtze river delta in the southwest of Changzhou city, P R China, was used for analysis. In addition to the refractive index, the Ångström exponents (AE) and dependence of broadband refractive indices on wavelength dependent single scattering albedo (SSA) for the atmospheric aerosols were also calculated. The results indicated the presence of absorbing aerosols in the ambient air which was validated by comparing the results obtained from AERONET data and HYSPLIT model. PyMieScatt survey iteration is a reliable inverse algorithmic method, used for the retrieval of complex RIs and its spectral dependencies, which, along with other optical parameters, can be used for source apportionment and for quantifying the effective radiative forcing of aerosols.

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Seed extraction methods affect the physiological quality of tomato seed and developing seedlings

Alemu Degwale[1], Tiru Tesfa[1], Belete Meseret[2] and **Solomon Fantaw[1]**

[1]Department of Horticulture; University of Gondar, College of Agriculture and Environmental Sciences, Ethiopia

[2]Department of Rural Development and Agricultural Extension; University of Gondar, College of Agriculture and Environmental Sciences, Ethiopia

Lack of appropriate seed extraction methods limits a sustainable supply of quality seed for tomato (Solanum lycopersicum L.). Natural fermentation and HCl acid methods are the most common methods used for tomato seed extraction. Short fermentation period causes inefficient mucilage removal while extended period causes spontaneous germination of seed during extraction. Lower concentrations of HCl acid cannot efficiently clean the gelatinous substance which inhibit germination though higher concentrations harm the embryo of seed affecting the seed physiology. This study was undertaken to determine effects of seed extraction method on physiological quality of tomato seed and developing seedlings. Fermentation (24, 48 or 72 h) and immersion in HCl acid at 1, 2, or 3% (V/V) for 30, 60 or 90 min were treatments. Tomato fruit pulp fermented for 24 h had a better seed germination percent which decreased after prolonged fermentation of 48 to 72 h. In contrast, the HCl acid seed extraction method produced bright seed with greater germination percent. The highest germination percent in Petri dish and pots was from immersion of tomato fruit pulp in 2% HCl acid for 60 min followed by immersion in the same concentration of HCl for 90 min. Germination percent was increased for every additional 30 min immersion in a 1% HCl concentration. At 2% HCl concentration, germination percent at 60 min was best compared with 30 and 90 min soaking. At 3% HCl, germination percent generally decreased with increasing immersion period. Seed extracted in 2% HCl for 60 min were superior in germination (99.33%), seedling emergence (89.76%), seedling length (14 cm), seedling fresh weight (558.1 g), seedling dry weight (26.73 g), and vigor-index I (1391) and II (2655). Seed were free from mycoflora. This seed extraction method can be used to produce high-quality seed, control seed-borne pathogens and produce vigorous tomato seedlings.

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Vulnerability assessment and modelling of urban growth using data envelopment analysis

A. Pouriyeh[1], F. Hosseinzadeh Lotfi[2] and **S. Pirasteh[3]**

[1]Department of Environmental Science, Faculty of Natural Resources and Environment, Science and Research Branch, Islamic Azad University, Iran

[2]Department of Mathematics, Science and Research Branch, Islamic Azad University, Iran

[3]Department of Geoinformatics and Surveying, Faculty of Geosciences and Environmental Engineering (FGEE), Southwest Jiaotong University, China

Determining the vulnerability of urban areas is one of the requirements that must be met before urban development to manage urban growth efficiently. This study aims to assess the vulnerability of urban areas using the data envelopment analysis method. We determined the physical growth of Yazd City in central Iran, utilizing the satellite images of 1976, 1984, 1993, 2006, and 2013. We studied the city's growth in three districts as well as different directions in different years. Afterwards, this study identified the geomorphological indicators influential on the development of the districts. The CRS(Constant Return to Scale) additive model was designed and proposed to investigate different districts' vulnerability and identify the areas with the highest and lowest vulnerability degrees. Finally, we introduced the districts with the least vulnerability as a pattern for the sustainable growth of the city. The modelling results show that District 1 in 1976 had the highest vulnerability (Z*0 = 0). Despite having the smallest area (input), this district has the highest unsuitable performance in terms of the geomorphological indicators. The performance of other units was found appropriate. Finally, the Districts 3 and 2 in 2013, with the ranks of 13 and 14, were recognized as the units with the least vulnerability and the highest sustainability, respectively.Therefore, we can recommend it for the sustainable and smart growth of the city to the government.

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Impact of energy efficiency, technology innovation, institutional quality, and trade openness on greenhouse gas emissions in ten Asian economies

Amena Sibghatullah
Karachi Institute of Economics and Technology, Pakistan

Despite the fact that Asian economies have experienced robust economic growth in recent decades, rising pollution emissions have raised worries among policymakers about the long-term stability of this output growth. Knowing this fact, the present study attempts to empirically analyze the impact of some important factors, e.g., energy efficiency, technology innovations, trade openness, and institutional quality, on environment in 10 Asian economies over the period 1995-2018. Taking into account the slope heterogeneity and cross-sectional dependence present in the data, Westerlund and Edgerton (2008) and Banerjee and Carrion-i-Silvestre (2017) cointegration techniques and cross-sectionally augmented autoregressive distributed lag model (CS-ARDL) estimation are applied. For robust analysis, augmented mean group (AMG) and common correlated effects mean group (CCEMG) are also employed in the study. The empirical findings provided by selected variables reveal that both trade openness and institutional quality have detrimental impact, whereas energy efficiency and technology innovations have favorable impact on environmental quality in the selected economies. Empirical findings are robust to various policy recommendations. To create a sustainable future environment, Asian economies should focus on the improvement of their institutions quality and increase investments in technology innovations. The Asian countries must encourage trade-related environmental regulations and energy efficiency policies for better and sustainable environmental quality.

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Assessing the synergic effect of land use and climate change on the upper Betwa River catchment in Central India

Amit Kumar
Indian Institute of Science Education and Research Bhopal, India

We have used Soil and Water Assessment Tool (SWAT) hydrological model to simulate the synergic effects of landuse/land cover (LU/LC) and climate change on the hydrological response of the Upper Betwa River Catchment (UBRC), a semi-arid region in Central India. We classified the Landsat satellite images of 1990 and 2018to obtain the dominant LU/LC classes (water body, built-up, forest, agriculture, and open land) in the catchment. The water body, built-up areas, and cropland have increased by 63%, 65%, and 3%, respectively, whereas forest cover and open land decreased by 16%and 23% in the UBRC from 1990 to 2018. The observed climate data in UBRC shows an increase in the average temperature and decrease in the total rainfall during the period 1980 to 2018. We set up this model for two different time periods, 1982–2000 and 2001–2018, using the LU/LC data of 1990 and 2018, respectively. Once the model is set up, we perform the calibration and validation by using the SWAT Calibration Uncertainty Program (SWAT-CUP). We considered 1991–1994 and 2001–2007 for the calibration and 1995–1998 and 2008–2014 time period for the validation. During the calibration and validation result of our model is satisfactory. The output of our calibrated model shows a relative decrease in rainfall (12%), surface runoff (21%), and percolation (9%) in the catchment during the period 2001–2018 as compared to 1982–2000.

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Health risks of atmospheric BTEX at an urban roadside of a north Indian terai region

A. Masih[1] and **J. K. Lal**[1]
Environment Research Lab, Department of Chemistry, St. Andrew's College, India

Volatile organic compounds (VOCs) in the ambient air are of great concern because of their potential health impacts, formation of organic aerosols, photochemical smog production, and so on. Benzene, toluene, ethylbenzene and m-, p-, o-xylene (BTEX) are the most typical components of VOC pollution in air. Over the last few decades, there has been a dramatic increase in the number of publications on traffic-related volatile organic compounds (VOCs), which indicates that automobiles in urban regions are the dominant source of BTEX. A monitoring program was designed and implemented to characterize roadside levels of BTEX during November, 2017 – February, 2018 at Gorakhpur – a terai belt of north India, on both weekdays and weekends. Samples of the air were collected at two sites namely, Nausad Traffic Junction (NTJ) and Golghar Traffic Junction (GTJ). Besides this, air samples were also collected at different distances (3m, 10m, 20m, 30m respectively) from the road. BTEX were sampled by SKC activated charcoal tubes and analyzed by GC–FID (Gas Chromatography- Flame Ionization Detector). Few of the samples were also monitored in semi-continuous mode by using ion science phocheck+ (Tiger) photo ionization detector (PID). Total BTEX concentration ranged from 8.9 - 63.1 µg m-3 at roadside sites, Gorakhpur. The total mean BTEX at Golghar Traffic Junction (GTJ) and Nausad Traffic Junction (NTJ) were 33.2 µg m-3 and 16.1 µg m-3 respectively. The concentrations of BTEX were plotted against distance from the road. The estimated integrated lifetime cancer risk (ILTCR) for benzene and ethylbenzene exceeded the threshold value of 1E-06, whereas the individual hazard quotients (HQ) did not exceed unity. The higher traffic volume and traffic congestion on weekdays lead to remarkably higher BTEX levels than those observed on Sunday at both the sites. Toluene was found to be dominant followed by benzene, xylene and ethylbenzene. Appropriate traffic management and vehicle emission control should be applied to reduce the VOC pollution in the city.

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Life cycle assessment of precast concrete sewage treatment plant

A. Sheth and **P. Thaker**
Fuji Silvertech Concrete Pvt. Ltd., Ahmedabad, India

The fast expansion of built habitats away from main sewage lines and more stringent environmental legislations have led to an extensive need for creating sewage treatment plant (STP) units in the country. An essential and decentralized infrastructure such as the STP which is expected to perform without much hassle should be selected and evaluated on basis of life cycle performance and costing. This paper first provides a brief overview of legislations and norms for sewage treatment in India followed by a compilation of the common types and pros and cons of different STP technologies. With this backdrop, the research identifies various indicators and a sustainability framework with life cycle perspectives for selection and evaluation of STPs. It was identified that modular precast concrete STP has multifold benefits in the performance of the STP. The research presents the case of modular precast concrete STP with MBBR Technology highlighting the importance and superiority of high quality and durable waste water retaining structure and its influence on the performance of the STP. Salient features of such a structure in terms of construction standards, pre-designed technology formulation, corrosion resistance, anti-floatation measures, structural stability and anti-overturning effects, longer service life, anti-leakage features, quick installation & commissioning, water-tight jointing at interconnections, anti-vandalism chances, occupied footprint and proven construction quality are captured qualitatively and quantitatively in the case study. Further, life cycle cost assessment of precast concrete STP has been performed and expressed herein indicating the suitability of this waste water treatment solution in India.

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Dark septate endophytes: Bioindicators of climate under mountain ecosystems

Anita Pandey
Department of Biotechnology, Graphic Era, India

Mountain ecosystems are recognized for their sensitivity to climate change, mainly due to the influence of low temperature on ecological processes. These ecosystems are likely to be dominated by the cold adapted microbial communities. Such unique ecosystems extend the opportunity to identify the bioindicators, much needed in the present scenario of climate change.

In natural ecosystems, plants harbor a variety of endophytic microorganisms where the fungal endophytes, ascomycota in particular, are most abundant. The plant-fungal symbiosis is likely to be decisive in predicting the ecosystem response to global change. Among the known fungal endophytes, the dark septate endophytes (DSE) are restricted to plant roots and distinguished by the presence of dark septate hyphae and microsclerotia. The melanin content, found in these endophytes provides protection to the hyphae against biotic or abiotic or both kind of stresses and play significant role in their survival, and the adaptation of the host plant under stressed climatic conditions.

DSE are being reported to colonize the root tissues of the host species from tropics to arctic and alpine habitats. Himalaya is known as one of the globally recognized hotspots of biodiversity due to its unique climate and rich biodiversity. The focus of this presentation will be on some recent reports emanated on the colonization of DSE in agricultural and forest species in high altitudes of Indian Himalayan region. Increasing knowledge on the colonization of the high altitude plants classifies these organisms as bioindicators of climate.

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Development of temporal model for analysis of heat transfer equipment subjected to fouling

S. Anitha Kumari
SRM Institute of Science and Technology, India

Soot blowers are employed in a predefined sequence and schedule to clean the ash particles on heat exchanger surface. However, considering the detrimental effects of frequent soot blow operation a criteria based system has to be adopted that involves soot blow activation based on a predefined cleanliness level. This insists the need for an online monitoring model to predict the Cleanliness Factor (CF). This paper analyzes the deposition of ash in power plant reheater with the objective of developing accurate prediction model for CF using Autoregressive Integrated Moving Average with eXplanatory variables (ARIMAX) model. In practice the covariates that should be included in the model is not known a priori and often with more number of candidate variables. The findings in this work reveal that the ARIMAX model including flue gas input temperature, 1 lag value of flue gas output temperatures, air flow rate, coal flow rate and attemperator flow rate in time series analysis of CF dataset produces a more robust predictive model. The model performance is quantified by two indicators namely and Root Mean Square Error (RMSE) and Akakie Information Criteria (AIC). To ensure the adequacy of the model residual diagnostics was performed which revealed that the Auto Correlation Function (ACF) plot of the residuals are uncorrelated and there is no considerable departure from white noise as the test statistic clearly shows that the p-values exceeds the 5% significance level for all lag orders. The recommendation suggested in this study can be applied to criteria based soot-blow operation where the soot blowers are operated when a predefined CF is reached.

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Theory of thermal conductivity in low dimensional structures

Ankita R. Chauhan and **Richa Saini**
Department of Physics, Kanya Gurukul Campus, India

The thermal conductivity of layered systems has been investigated in terms of in-plane and cross-plane thermal conductivities using modified Callaway model. This formulation uses the relaxation times of various contributing processes that have been obtained in terms of line widths with the help of many-body quantum dynamics of phonons and electrons and the final forms of relaxation times for different scattering processes in low dimensional superstructures have been achieved. The evaluation of line widths is carried out by double time temperature dependent phonon Green's function obtained via a Hamiltonian that comprises the effects of electron, phonon, impurities and anharmonicities. The thermal conductivity of semiconductor layered structures has been analyzed over a wide temperature range and fairly good agreement between theory and experimental observations has been reported.

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Zero-truncated poisson-power function distribution

Anthony Chukwudi Akpanta[2], Idika Eke Okorie[1], Johnson Ohakwe[3], David Chidi Chikezie[2], Chris Uche Onyemachi[2] and **Manoj Rastogi[4]**

[1]*School of Mathematics, University of Manchester, UK*
[2]*Department of Statistics, Abia State University, Nigeria*
[3]*Department of Mathematics and Statistics, Faculty of Sciences, Federal University, Otuoke*
[4]*National Institute of Pharmaceutical Education and Research, India*

Construction of flexible distributions for improved modeling of complex real-life data is currently receiving a widespread attention by statisticians and researchers in other disciplines. In this paper, we introduce and study a new distribution called the zero-truncated Poisson-power function distribution (ZTPPFD). The ZTPPFD was obtained by compounding the zero-truncated Poisson distribution and the power function distribution. The asymptotic, shape properties, and other mathematical properties of the distribution were studied. Moreover, the power function distribution is identified as the limiting case of the ZTPPFD when the only parameter λ of the zero-truncated Poisson distribution approaches zero. However, the hazard rate function of the new distribution is found to contain some important shapes of the hazard rate of some lifetime phenomena that are commonly encountered in practice, they are increasing, bathtub , and upside-down bathtub shapes. Estimation of the distribution parameters was carried out by the method of maximum likelihood and a numerical study show that the maximum likelihood estimation method provides good estimates of the distribution parameters. Two examples are presented to illustrate the usefulness and fitting performance of the ZTPPFD in modeling complex real data-sets. The ZTPPFD can be applied in other areas such as demography, reliability engineering, meteorology, and hydrology.

Understanding the mechanism of high temperature stress tolerance in fishes

Arabinda Mahanty
ICAR-National Rice Research Institute, India

Temperature plays an important role in gross physiology of organisms and increase or decrease in environmental temperature beyond an optimal limit disturbs cellular homeostasis. The impact of high temperature is more severe in poikilothermic animals like fish and leads to retardation in growth, reproduction, causes even death, affecting the overall productivity. High temperature has become the major environmental concern in the climate change regime as according to a report by Intergovernmental Panel on Climate Change (IPCC), 20% of the species assessed so far are at the risk of extinction if the global temperature rises above 1.5-2°C. To safeguard life forms from the vagaries of high temperature stress in the climate change regime, it is necessary to understand the molecular mechanism of thermotolerance and devise mitigation action plans. This has been evidenced in recent times in form of mass mortalities of fishes and other aquatic animal during peak summer. Thus, we used a number of omics platforms such as proteomics, transcriptomics, lipidomics to understand the response of heat stressed fishes. The information generated from the studies could be helpful in devising mitigation plans to safeguard the aquaculture industry in the realm of global climate change.

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Investigation of trace elements and F, its geochemistry and associated health risk in groundwater of industrial region of Sonbhadra district, Uttar Pradesh, India

Arif Ahamad
Daulat Ram College, University of Delhi, India

Coal mining and coal burning dominated region was selected to assess pollution load of the groundwater with reference to the trace elements (i.e. As, Hg, Cd, Cr, Cu, Fe, Mn, Zn, Ni,Co, and Pb) and F in Obra, Renukoot and Anpara industrial clusters of Sonbhadra district, Uttar Pradesh, India. 220 groundwater samples were collected during post- and pre-monsoon seasons. Piper diagram showed that most of the samples are of Ca-Mg-HCO_3-Cl-SO_4 type. Gibbs plot depicted that weathering of rock minerals has affected the hydrogeochemistry of the study area. Fluoride contamination was observed only in few borewells of Renukoot and Anpara whereas nitrate contamination was observed in most of the borewells of all the three clusters in both the seasons, as per WHO standards. The primary cause of nitrate contamination in the groundwater was found to be from anthropogenic sources such as sewage and manure. All three clusters were found to be severely contaminated with Fe, Pb, Cd, Cr, As and Hg in both the seasons. For all the three clusters, the mean values of heavy metal pollution (HPI) were found above the critical index in both the seasons. For the majority of groundwater samples across the clusters during both the seasons, substantial non-cancer health risk was observed due to target Hazard Quotient (THQ) values of Cr, Cd, As, Pb and Hg higher than unity. THQ values of trace elements and F showed that children are at higher risk than the adult of the study area during both the seasons. Carcinogenic risk due to Cr was observed highest followed by As and Pb. Pictorial representation of the affected persons showed mild to severe cases of dental fluorosis. Finding of this study may be used as a database by the government to make proper guidelines for the safe use of drinking water.

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Adaptive analytical fault estimation and fault tolerant control of quadrotor in the presence of uncertainty and disturbance

A. Mohammadi and **A. Ramezani**
Tarbiat Modares University, Iran

Nowadays, with the advancement of technology and the increasing use of the machine for daily tasks, the optimal use of these devices is of paramount importance. One of the main issues in control and navigation of quadrotors is handling the affected faults by fault tolerant control (FTC) methods. In this paper an adaptive analytical method is proposed in order to estimate the actuator fault of quadrotor in the presence of model uncertainties and external disturbances. In fact the adaptive analytical redundancy relation is employed to detect, estimate and tolerate the faults affected the quadrotor system by updating the control inputs using appropriate adaptation law. In addition it will be shown that the proposed control strategy has robustness against the uncertainties and external disturbances. By using this analytical method, there is no need to use observer in order to fault diagnosis. In the other words we use analytical relation for detection, estimation and tolerant control of fault instead of constructing dual model of system (observer system). This advantage results acceptable outputs in faulty system. Simulation results prove that the proposed FTC methods can maintain the system in a good trajectory tracking situation in faulty conditions.

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Developing an urban runof management model by using satellite precipitation datasets to allocate LIDs under climate change conditions

A.Oliazadeh[1], O. Bozorg-Haddad[2], M. Mani[3] and **X. Chu[4]**

[1,2]University of Tehran, Iran

[3]Louisiana State University, Baton Rouge, USA

[4]North Dakota State University, USA

Flood control and management are becoming increasingly important to many cities due to urban development and significant changes in the natural climate pattern. The objective of this study is to evaluate the effect of climate change on hydrological conditions and runoff management for low impact development (LID) systems in the Tehran municipality area. The TRMM satellite precipitation data (3B42) were first analyzed for the study area by using the eleven models recommended by the IPCC. The MIROC model was identified as the best climate model among several models according to its best performance for R2, RMSE and MAE for providing future precipitation data. Then, the precipitation simulated by the MIROC model was downscaled by the LARS-WG model under two scenarios, RCP 4.5 and RCP 8.5. Furthermore, runoff was calculated by the Storm Water Management Model (SWMM) for different storms. The results showed an increase in the intensity of the 25-year storm in the time horizon of 2021-2040, while the average annual precipitation showed a decrease of 30%. In this study, two LID options (permeable pavement and bio-retention cell) were selected and optimized with two objectives: (1) minimizing the produced runoff and (2) minimizing the costs of LID construction and maintenance under climate change conditions. The results indicated that the running costs increased by 30% and 55% for the scenarios of RCP 4.5 and RCP 8.5, respectively. These costs tended to prevent changes of up to 250×103 m3 in the first scenario and 328×103 m3 in the second scenario in the volume of floodwater produced under climate change conditions.

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Exploring the missing link between soil total antioxidant capacity and herbicide-induced stress on the earthworm Eudrilus eugeniae (Kinberg)

Asima Subhadarshini[4], Choudhury Suryakant Mishra[1], Suryasikha Samal[2], Nayan Kumar Sishu[3] and **Priyadarshani Naik[1]**

[1]College of Basic Science and Humanities, India
[2]C.V.Raman Golbal University, India
[3]Vellore Institute of Technology, India
[4]ITER, Siksha O Anusandhan University Odisha, India

Herbicide application and residue accumulation in farm soils have deleterious effects on non-target fauna such as earthworms. Although previous studies have documented both positive and deleterious effects of herbicides on soil biota, reports are rare on possible toxicity reduction by raising soil total antioxidant capacity (TAC). Here we review the impact of pretilachlor, a herbicide on the morpho-histology and physiology of the earthworm Eudrilus eugeniae in soil amended with farmyard manure (FYM), poultry manure (PM) and vermi manure (VM), sources of antioxidants over a period of 168 h. The results indicated a significant spike in the TAC of amended soils relative to control. Dermal undulation, setal aberrations, muscular anomaly, protein and lipid peroxidation variations in the activities of lactate dehydrogenase (LDH) and catalase (CAT) were significantly less in animals from amended soils. The maximum percent increase in protein (314%) and reductions in LPX (87%), LDH (87.9%) and CAT (87.3%) were observed in the earthworm from VM-amended soil. The increase in TAC was also maximum (109.9%) in soil amended with VM. A significant negative correlation between soil TAC with the biochemical parameters was observed and confirmed through receiver operator characteristics (ROC) and principal component analysis (PCA). The novelty of the present study includes exploring the missing link between the antioxidant level of organically amended soil and the herbicide-induced oxidative stress in the earthworm E. eugeniae. It was concluded that soils with high levels of antioxidants could reduce oxidative damage in E. eugeniae due to herbicide toxicity.

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PPG-based human identification using Mel-frequency cepstral coefficients and neural networks

Atef Abou Elazm[2], Ali I. Siam[1], Nirmeen A. El-Bahnasawy[3], Ghada M. El Banby[4] and **Fathi E. Abd El-Samie[2]**

[1]Department of Embedded Network Systems Technology, Faculty of Artificial Intelligence, Kafrelsheikh University, Egypt

[2]Department of Electronics and Electrical Communications Engineering, Faculty of Electronic Engineering, Menoufia University, Egypt

[3]Department of Computer Science and Engineering, Faculty of Electronic Engineering, Menoufia University, Egypt

[4]Department of Industrial Electronics and Control Engineering, Faculty of Electronic Engineering, Menoufia University, Egypt

One of the known problems in security systems is to identify persons based on certain signatures. Biometrics have been adopted in security systems to identify persons based on some physiological or behavioral characteristics that they own. Photoplethysmography (PPG) is a physiological signal that is used to describe the volumetric change of blood flow in peripherals with heartbeats. The PPG signals gained some interest of researchers in the last few years, because they are used non-invasively, and they are easily captured by the emerging IoT sensors from fingertips. This paper presents a PPG-based approach to identify persons using a neural network classifier. Firstly, PPG signals are captured from a number of persons using IoT sensors. Then, unique features are extracted from captured PPG signals by estimating the Mel-Frequency Cepstral Coefficients (MFCCs). These features are fed into an Artificial Neural Network (ANN) to be trained first and used for identification of persons. A dataset of PPG signals for 35 healthy persons was collected to test the performance of the proposed approach. Experimental results demonstrate 100% and 98.07% accuracy levels using the hold-out method and the 10-fold cross-validation method, respectively.

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The association of socio-demographic and environmental factors with stunting among under-five children in Hawassa City, Sidama National Regional State, Ethiopia

Berhanu Kibemo[1] and **Baye Gelaw**[2]

[1]*School of Nutrition, Food Science and Technology, College of Agriculture, University of Hawassa, Ethiopia*

[2]*Department of Medical Microbiology, School of Biomedical and Laboratory Sciences, College of Medicine and Health Sciences, University of Gondar, Ethiopia*

Undernutrition in children is a challenging problem in developing countries, including Ethiopia. Stunting is the most prevalent form of undernutrition. The majority of studies on childhood stunting and its associated factors focused on children, maternal and socioeconomic components. However, a few studies reported poor WaSH status and antibiotic exposure as environmental risk factors for child stunting, and the case of socio-demographic factors also lacks consistency. Concerning this, there is a lack of information in Ethiopia. Therefore, the present study assessed the association of socio-demographic, WaSH, and antibiotic exposure with stunting among under-five children. A cross-sectional study was conducted involving 340 mother-child pairs. Anthropometric data were collected using standard and calibrated height and weight scales. For factorial data, an interviewer-guided standard questionnaire was used. Logistic regression analyses were used to identify factors determining childhood stunting. In the present study, the prevalence of stunting, underweight, and wasting was 14·7 % (95 % CI 10·9, 18·5), 4·4 % (95 % CI 2·4, 6·8) and 2·1 % (95 % CI 0·6, 3·5), respectively. Low dietary diversity, being born from a mother with an education level of secondary school, and belonging to a female-headed household were positively associated ($P < 0·05$) with stunting. The prevalence of overall undernutrition was lower (21·2 %) in the study area. Stunting was significantly associated with dietary diversity, maternal educational level, and sex of households head. The government policy should focus on enhancing the dietary diversity of households, and encouraging women's education.

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Green routing problem fundamentals for preventing climate change

Bochra Rabbouch
Higher Institute of Applied Science and Technologies, University of Sousse, Tunisia

Global climate change has already had noticeable impacts on the environment. Global temperature has risen, Mountains of ice have shrunk, sea levels have augmented, and oceans become more acid.

Unfortunately, human activities (primarily the burning of fossil fuels) are the primary driver of those changes. In particular, transportation, as an elemental human activity, devotes to fuel consumption and CO2 emissions. This issue leads to air pollution, climate change and harm the natural environment.

Green or sustainable routing problems are new variants of routing problems aiming to reduce gaz emission while routing the vehicles and considering environmental sustainability in transportation and logistics. The objective of this presentation is to display a clear analysis on how combinatorial optimization can contribute to green transportation as well as a comprehensive state-of-the-art covering all known sustainable routing and scheduling problems and their variants.

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Stepwise GIS-based groundwater recharge computation under Urbanization impacts for the Kinshasa capital region (D. R. Congo)

Mulowayi Mubulayi Cedrick[1,2,3], Mohamed Meddi[1], Ayoub Zeroual[1], Raphael Tshimanga[2] and **Clement N'zau Umba-di-Mbudi[3]**

[1]Higher National School for Hydraulics, Algeria
[2]Research Center in Water Resources of the Congo Basin (CRREBaC), Department of Natural Resources Management/ Faculty of Agronomic Sciences, University of Kinshasa, D.R. Congo
[3]Geo-Hydro-Energy Group, Department of Geosciences, University of Kinshasa, D.R. Congo

The Kinshasa region is well-known in the water world for its nearly half-year rainfall and the presence of the gorgeous Congo River and its tributaries. However, these water resources are under significant strain as a result of population growth and urbanization, which simultaneously raises water consumption. This circumstance results in an overuse of existing water resources, including groundwater, particularly when the drinking water utility does not keep pace with population growth. This is why, in this study, the Spatio-temporal variability of urban expansion was used to establish stepwise GIS-based groundwater recharge computations for time series dating from 2000, 2010, and 2020 over an area of approximately 10,000 km2. The GIS environment was utilized to compile spatial data, which resulted in the creation of maps such as Rainfall Distribution, Evapotranspiration Distribution, Digital Elevation Model, Slope, Drainage Density, Soil, LU / LC, Curve Number Grid, and Runoff Map. After evaluating and assembling all of these maps in a GIS context using a water balance formula, we were able to generate stepwise groundwater recharge estimations for the years 2000, 2010, and 2020, showing areas of high, moderate, and poor recharge. The maximum groundwater recharge estimates for 2000, 2010, and 2020 were 310.518mm/yr, 310.142mm/yr, and 315.492mm/yr, respectively, indicating that areas with high runoff potential have low groundwater recharge rates and vice versa. Overall, groundwater recharge is higher in the Southwest, where we find sand soil type, and lower in the rest of Kinshasa Capital Region, where we find paved areas, clay, clay (light), sand clay, and weathered rock.

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Accelerating phytoextraction of petroleum Hydrocarbon with organic stimulant

Chioma Bella Aliku[1], Christian N. Madu[1,2] and **OrevaOghene Aliku[3]**

[1]Centre for Environmental Management and Control, University of Nigeria, Nigeria
[2]Department of Management and Management Science, Pace University, USA
[3]Department of Soil Resources Management, University of Ibadan, Nigeria

Phytoremediation has widely been recognized as an eco-system friendly and effective technique for soil remediation. However, this method is generally slow, and most plants used for phytoextraction are incapable of thriving in crude oil polluted soils with high concentrations of petroleum hydrocarbon. Hence, organic stimulants were developed for accelerating the phytoremediation of crude oil polluted soils by enhancing the growth of cowpea through nutrient supplementation, and increasing the bioavailability of petroleum hydrocarbon by saponification. Moringa and pawpaw seeds are high in plant available nutrients and contain saponin, a phytochemical that increases the bioavailability of contaminants. Although both seeds and moringa seed powder have been used for water purification, they have not been explored in soil remediation studies. For these reasons, pawpaw seeds were processed into powdery form to increase their surface area as organic stimulants for enhancing phytoremediation of crude oil polluted soil. This study investigates the performance of pawpaw seed powder, relative to moringa seed powder, in increasing the removal rate of petroleum hydrocarbon by cowpea under crude oil polluted soil conditions. The key functions of the newly developed organic stimulant include: (i) increased bioavailability of petroleum hydrocarbon for phytoextraction; (ii) enhanced shoot production in cowpea; (3) increased capacity of cowpea to remove petroleum hydrocarbons from soils.

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Spatial variation in risk factors of lymphatic filariasis in hotspot zones in Ghana

D.C.B.M. Asare[1], E.V. S Kwarteng[1], S.A. Andam-Akorful[1], A. Kwarteng[2], F.B. Osei[3] and **A. A. Duker[1]**

[1]Department of Geomatic Engineering – Kwame Nkrumah University of Science and Technology, Ghana
[2]Department of Biochemistry and Biotechnology - Kwame Nkrumah University of Science and Technology, Ghana
[3]Department of Earth Observation Science – University of Twente, Netherlands

Lymphatic Filariasis (LF), a parasitic nematode infection, poses a huge economic burden to affected countries. LF endemicity is localized and its prevalence is spatially heterogeneous. In Ghana, there exists differences in LF prevalence and multiplicity of symptoms in the country's northern and southern parts. Species distribution models (SDMs) have been utilized to explore the suite of risk factors that influence the transmission of LF in these geographically distinct regions.

Presence-absence records of microfilaria (mf) cases were stratified into northern and southern zones and used to run SDMs, while climate, socioeconomic, and land cover variables provided explanatory information. Generalized Linear Model (GLM), Generalized Boosted Model (GBM), Artificial Neural Network (ANN), Surface Range Envelope (SRE), Multivariate Adaptive Regression Splines (MARS), and Random Forests (RF) algorithms were run for both study zones and also for the entire country for comparison.

Best model quality was obtained with RF and GBM algorithms with the highest Area under the Curve (AUC) of 0.98 and 0.95, respectively. The models predicted high suitable environments for LF transmission in the short grass savanna (northern) and coastal (southern) areas of Ghana. Mainly, land cover and socioeconomic variables such as proximity to inland water bodies and population density uniquely influenced LF transmission in the south. At the same time, poor housing was a distinctive risk factor in the north. Precipitation, temperature, slope, and poverty were common risk factors but with subtle variations in response values, which were confirmed by the countrywide model.

This study has demonstrated that different variable combinations influence the occurrence of lymphatic filariasis in northern and southern Ghana. Thus, an understanding of the geographic distinctness in risk factors is required to inform on the development of area-specific transmission control systems towards LF elimination in Ghana and internationally.

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Impact of irrigation practices on Gilgel Abay, Ribb and Gumara Fisheries, Tana Sub-Basin, Ethiopia

Dagnew Mequanent[1,2], Minwyelet Mingist[2], Abebe Getahun[3] and **Wassie Anteneh[4]**

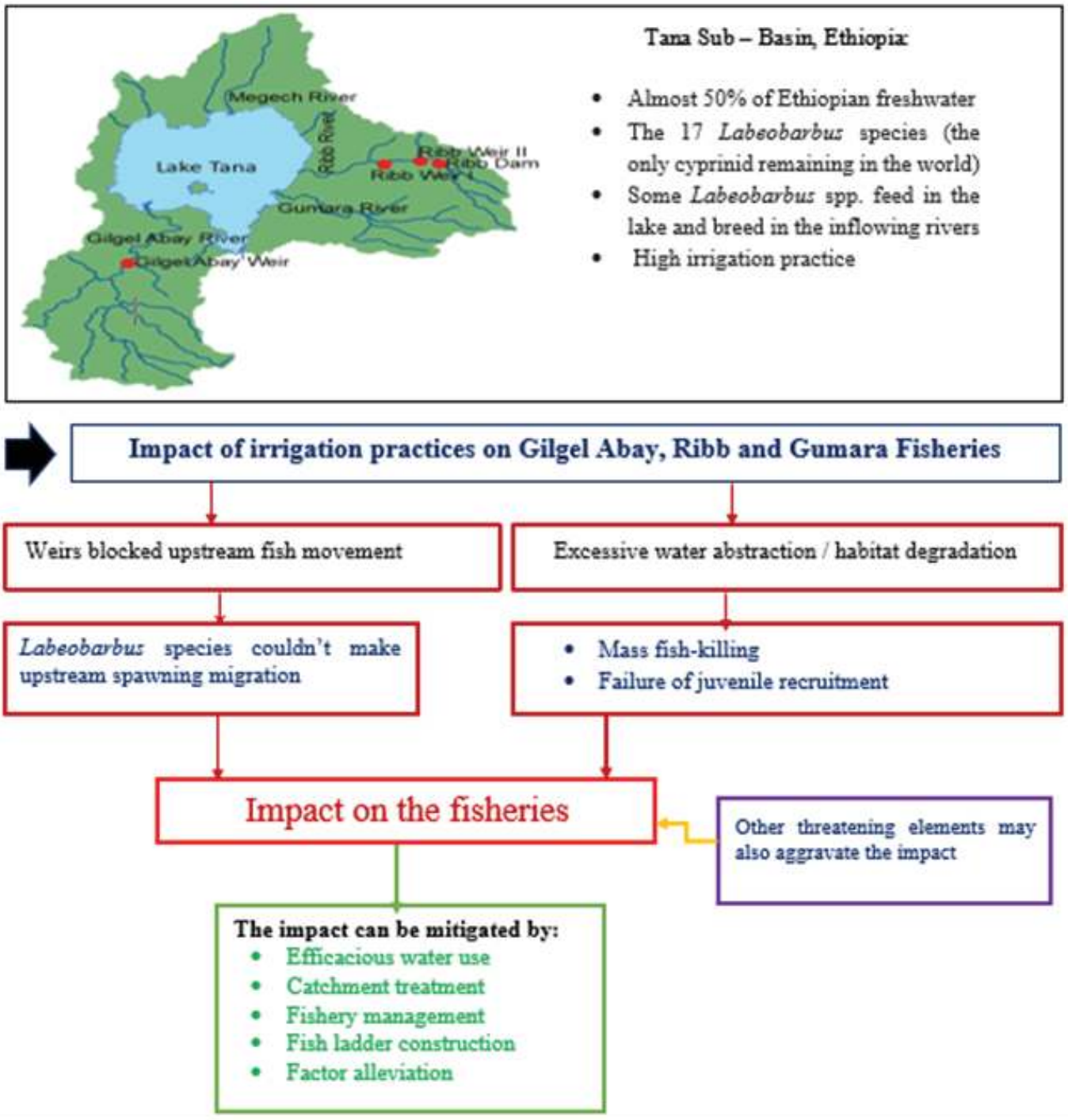
[1]*Amhara Design and Supervision Works Enterprise, Ethiopia*

[2]*Department of Fisheries and Aquatic Sciences, School of Fisheries and Wildlife, College of Agriculture and Environmental Sciences, Bahir Dar University, Ethiopia*

[3]*Department of Zoological Sciences, Addis Ababa University, Ethiopia*

[4]*Department of Biology, College of Science, Bahir Dar University, Ethiopia*

In Ethiopia, particularly in the Tana Sub-Basin, irrigation development practice is increasing. However, this development ignored the fisheries; no, enough information about its effects. The sub-basin is rich in fisheries, including the 17 Labeobarbus species (the only remaining cyprinid species flock in the world). The fishery also supports over 6,000 fishers. Hence, this study investigated the impact of irrigation practices on the Gilgel Abay, Ribb, and Gumara fisheries. Methods include fish sampling below and above the weirs; expert interviews; key informant interviews; secondary data; and impact significance matrix methods. The data collection time was from July 2019 to June 2020. The analysis of the data was qualitative and quantitative. The existing irrigation system affects fisheries by blocking upstream spawning migration routes (Gilgel Abay Weir and Ribb Dam, for sure catch below the Gilgel Abay Weir, significantly higher than above the weir, Shannon Index (H'), $P < 0.001$). Besides, according to local sources, after 2007, Gumara and Ribb rivers became seasonal because of excessive water abstraction for irrigation, resulting in mass fish-killing and the failure of juvenile recruitment to the lake. In one instance, we recorded the deaths of over 930 adults and juveniles on the Gumara and the Ribb rivers. The other problem is that, due to low water volume, even non-fishers collect fish from the pools; and during spawning time, fishers target spawning migratory species at the weirs where the catch is prime. Other threatening elements can also aggravate the impact. Hence, these impacts need to be ameliorated by practicing efficacious water use, catchment treatment, fishery management, fish ladder development, and factor alleviation can be solutions.


Tana Sub – Basin, Ethiopia:
Almost 50% of Ethiopian freshwater
The 17 Labeobarbus species (the only cyprinid remaining in the world)
Some Labeobarbus spp. feed in the lake and breed in the inflowing rivers
High irrigation practice
Megech River
Ribb River
Lake Tana
Ribb Weir II
Ribb Dam
Ribb Weir I
Gumara River
Gilgel Abay River
Gilgel Abay Weir
Impact of irrigation practices on Gilgel Abay, Ribb and Gumara Fisheries
Weirs blocked upstream fish movement
Excessive water abstraction / habitat degradation
Labeobarbus species couldn't make upstream spawning migration
Mass fish-killing
Failure of juvenile recruitment
Impact on the fisheries
Other threatening elements may also aggravate the impact
The impact can be mitigated by:
Efficacious water use
Catchment treatment
Fishery management
Fish ladder construction
Factor alleviation

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Soil gas radon concentration measurement in estimating the Geogenic radon potential in Abeokuta, Southwest Nigeria

Tunde Daniel Samuel[1], Idowu Peter Farai[2] and **Ayodele Samuel Awelewa[3]**

[1,2]Department of Physics, University of Ibadan, Nigeria

[3]Department of Physics, Kent State University, USA

The majority of natural source radiation comes from radon, which accounts for more than half of all natural-source radiation. Rn – 222 ($T_{1/2}$=3.82 days) in the U – series builds up more easily in homes than its other isotope Rn – 220 ($T_{1/2}$=50$_s$) in the Th – series, this make it significant as far as radiological health hazard is concerned. The study aimed at determining what the earth delivers in term of radon emanating or diffusing from the ground to the surrounding especially in areas underlined by a geological layer showing high potential of uranium 238, and it is been estimated from the measured values of soil gas radon concentration and soil air permeability in the environment.

The soil gas in-situ radon-222 concentration was measured at 28 locations in Abeokuta, Nigeria using a Rad7 solid-state detector. The measurement sites were chosen based on the extent of the 6 geological formations chosen in a cell, with spatial sample of at least 3 km between them. The measuring sites' geographical coordinates were established using the Global Positioning System compass. The hydraulic conductivity measuring technique was also used to determine the soil-air permeability for the soil samples collected at the various locations. The measured soil gas radon concentration and the soil-air permeability where used to estimate the geogenic radon potential. The soil gas radon activity ranged from (1004 – 19250) Bq/m3. The soil-air permeability ranged from (9.7 × 10^{-13} to 2.64 × 10^{-11}) m^2. The Geogenic Radon Potential ranged from 0.5 to 33 whereby 7.69% of the study are had a minimum GRP value (10<GRP<35) while 92.31% had a low GRP value (GRP<10) as based on classification of GRP according to Neznal. Therefore, the GRPs for Abeokuta are low compared with the level where remedial action is needed.

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A review on land use and land cover change in Ethiopian Basins

Dereje Adeba[2], Motuma Shiferaw Regasa[1] and Michael Nones[1]

[1]Department of Hydrology and Hydrodynamics, Institute of Geophysics Polish Academy of Sciences, Poland

[2]Department of Hydraulic and Water Resources Engineering, College of Engineering and Technology, Wollega University, Ethiopia

Land Use Land Cover (LULC) changes analysis is one of the most useful methodologies to understand how the land was used in the past years, what types of detections are to be expected in the future, as well as the driving forces and processes behind these changes. In Ethiopia, Africa, the rapid variations of LULC observed in the last decades are mainly due to population pressure, resettlement programs, climate change, and other human- and nature-induced driving forces. Anthropogenic activities are the most significant factors adversely changing the natural status of the landscape and resources, which exerts unfavourable and adverse impacts on the environment and livelihood. The main goal of the present work is to review previous studies, discussing the spatiotemporal LULC changes in Ethiopian basins, to find out common points and gaps that exist in the current literature, to be eventually addressed in the future. A total of 25 articles, published from 2011 to 2020, were selected and reviewed, focusing on LULC classification using ArcGIS and ERDAS imagine software by unsupervised and maximum likelihood supervised classification methods. Key informant interview, focal group discussions, and collection of ground truth information using ground positioning systems for data validation were the major approaches applied in most of the studies. All the analysed research showed that, during the last decades, Ethiopian lands changed from natural to agricultural land use, waterbody, commercial farmland, and built-up/settlement. Some parts of forest land, grazing land, swamp/wetland, and shrub land, rangeland, and bare/rock out cropland cover class changed to other LULC class types, mainly as a consequence of the increasing anthropogenic pressure. In summary, these articles confirmed that LULC changes are a direct result of both natural and human influences, with anthropogenic pressure due to globalisation as the main driver. However, most of the studies provided details of LULC for the past decades within a specific spatial location, while they did not address the challenge of forecasting future LULC changes at the watershed scale, therefore reducing the opportunity to develop adequate basin-wide management strategies for the next years.

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Evaluation of maize cob ash as partial replacement for mineral filler in hot-mix asphalt concrete production

K. Destaw, G. Nigus, M. Awoke, Y. Worku and **S. Abebe**
Debre Tabor University, Ethiopia

The effect of maize cob ash as a partial replacement of conventionally used filler material in hot mix asphalt for binder course was evaluated. All the volumetric properties and the physical properties of the asphalt mixture were evaluated to determine the optimum replacement of MCA in the production of binder courses for heavy traffic roads. The content of crushed stone dust (CSD) filler was replaced with MCA at a rate of 0% (control), 25%, 50%, 75%, and 100% by weight of CSD. A total of thirty (30) mix specimens prepared, fifteen asphalt concrete samples were prepared by a 6% of crushed stone dust as filler by weight of aggregate with bitumen content between 4.5% and 6.5% at varying increments of 0.5% by total weight of the mix to determine the optimum bitumen content. The remaining specimen was prepared at 5.30% OBC to find out the optimum replacement rate of maize cob ash (MCA). The stability, flow, unit weight, voids filled with asphalt (VFA), air voids, and voids in mineral aggregate (VMA) were determined. The values of stability, flow, unit weight, air voids and voids in mineral aggregate and voids filled with asphalt at 75 % replacement of crushed stone dust with maize cob ash were, 11.7 KN, 3.13 mm, 2.360 g/cm3, 4.0 %, 14.58 %, and 72.56 %, respectively. Research findings indicated an optimum value of maize cob ash could be replaced the crushed stone dust is 75% by weight of CSD filler or 4.5% by weight of aggregate in the production of hot mix asphalt binder course for heavy-trafficked roads. Hence, the maize cob ash is recommended to use as a replacement for CSD fillers in the hot mix asphalt binder course.

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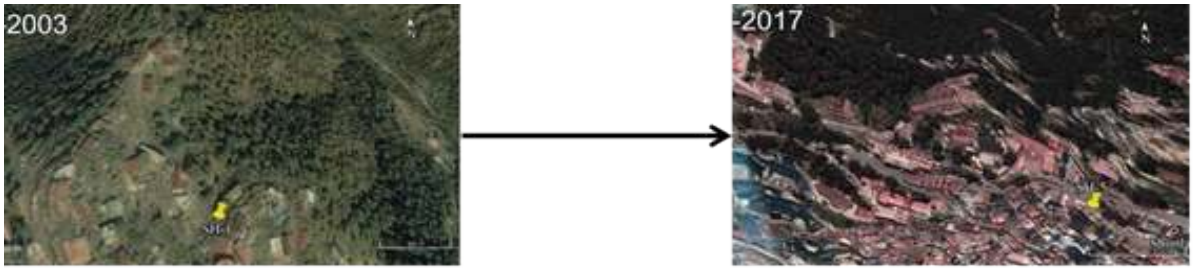
Impact of urbanization and climate change on Drosophila repleta in Western Himalayas

Divya Singh and **Seema Ramniwas**
Chandigarh University, India

Climate change and anthropogenic disturbances significantly influence the distribution of ectotherms. With the increasing global temperature and urbanization, there are possibilities of rapid shift in geographic abundance and/or local extinction of species. In this study, we report increase in local abundance of Drosophila repleta, a warm adapted species never reported until 2003 from higher altitude in Western Himalayas, from lower altitude to mid-high-altitude localities due to recent rapid urbanization and global warming. Comparison of life-history traits at two different temperatures (17°C and 25°C) showed significant reduction in trait values at 17°C; indicating lower evolutionary ability for adaptation to colder and drier habitats. When we compared performance of life-history traits on different food resources (lab media vs mix media), a significant increase in fecundity, viability, and percent of adult emergence was observed in flies grown on mix media. This indicates that the ability to change in oviposition preference and flexibility in utilization of food resources helped this species to survive in the new habitats. With expected increase in global temperature and urbanization in near future D. repleta will become more abundant in urban environments and may pose health risk due to its ability to transfer disease causing organisms.



Increase in Urbanization from 2003 to 2017 in Himachal

Increase in local abundance of Drosophila repleta due to urbanization

Due to urban environment D. repleta increases its flexibility in the resource utilization and show changes in life-history traits

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Determinants of Good Forest Governance in South-eastern Ethiopia: The case of the Bale Eco Region

Endalkachew Birhan[1], Engdawork Assefa[2] and **Maria A. Petrova[3]**
[1]*Madda Walabu University, Ethiopia*
[2]*Addis Ababa University, Ethiopia*
[3]*Georgetown University, USA*

This study aims to identify the determinants of good forest governance in the Bale Eco Region. The data was collected using a mixed methods approach through questionnaires, key informant interviews, and focus group discussions. The quantitative data was analyzed using both descriptive and binary logistic regression analysis, while the qualitative data was analyzed through descriptive analysis. The results showed that lack of accountability was the major problem of good forest governance in the study area, followed by low efficiency, and then by fairness, effectiveness, transparency, and participation. The results of the binary logistic regression has also supported these findings as it has showed that the effectiveness of forest governance is determined by accountability, efficiency, and fairness, while participation and transparency are insignificant. Hence, it is recommended that the government and other concerned stakeholders should work mainly on improving accountability, efficiency, and fairness of forest governance in the Bale Eco-Region.

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Search for autochthonous plants as tool for restoration of metal-polluted coal mine soil in Okaba, Nigeria: A hierarchical cluster approach

Eneojo Godwin Ameh
Department of Geological Sciences, Federal University Gusau, Nigeria

Coal mining activities have been ongoing in Okaba for years without adequate attention paid to pollution and reclamation. Soil and plants were sampled from Okaba coal mine to determine the metal amount in the soil, plants and to single out plants with potential for phytoremediation. The samples were prepared, separated into various tissues, labeled and taken to the laboratory. Digestion was carried out using acid mixture of nitric acid (HNO3): perchloric acid (HCLO4) for the plants and nitric acid (HNO3): hydrochloric acid (HCl): perchloric acid (HCLO4) was used for the soil. The concentrations of metals from the samples were determined using EDX3600B X-ray fluorescence spectrometer (Sky ray Instruments Inc., USA). Bioconcentration factor (BCF), translocation factor (TF), and bioaccumulation coefficient (BAC) or extraction coefficient (EC) were calculated to pin point plants that have ability for hyperaccumulation, phytoextraction, phytostabilization and the capacity to store up these metals for harvesting. Hierarchical cluster analysis was performed to highlight the relationship between the variables. This study has revealed that *Ageratum conyzoides Linn* (ACL), *Desmodium velutinum* (DV), *Triumfetta rhiomdoidea Jacq.* (TRJ), *Gleichenia linearis* (Burns) (GL), *Selaginella myosurus* (SM), and *Sida linifolia juss.excav.* (SL) had potential as hyperaccumulators of nickel. Eleven (11) plants had potential for phytoextraction of manganese (Mn), and six (6) plants had stabilization potential for the same metal. Eight (8) phytoextractors and seven (7) stabilizers were recorded for Ni. *Eclipta alba* (L) *Hassk* (EAH) (location 4) and TRJ were phytostabilizer plants for Pb. Six (6) other plants had potential as phytoextractors of Pb. Eight (8) of the studied plants were suitable for phytoextraction of Ni, and five (5) plants were suitable as phytostabilizers. Most of the plants were found to be useful for phytoremediation of the soil.

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Knowledge, attitude, practice and associated factors of health professionals towards podoconiosis in Gamo zone, Ethiopia, 2019

Eyayou Girma[3], Chuchu Churko[1], Mekuria Asnakew Asfaw[1], Abayneh Tunje[2] and Zerihun Zerdo[4]

[1,2,4]Arbaminch University Scholl of Publich Health Arbaminch Ethiopia, Ethiopia

[3]Arbaminch University Scholl of Medicine, Ethiopia

Background: Podoconiosis is entirely preventable, non-communicable disease with high potential of elimination. The prevalence of podoconiosis in Ethiopia was 7.45%. One of the pillars for elimination of podoconiosis is morbidity control and management.

Objective: the present study aimed to assess the knowledge, attitude, practices and associated factors of health professionals towards podoconiosis cause, prevention and treatments.

Methods: Facility based cross-sectional study was conducted. The source population was all health professionals currently working in public health facilities. The final estimated sample size was 349. A pretested self-administrated structured questionnaire was used to collect the data. The data were coded, entered, and cleaned by using Epi.info version7, and analyzed by using SPSS version 20.

Result: A total of 320 health professionals participated in the study. Sixty eight (23.1%) health professionals had poor knowledge towards podoconiosis. Seventy (21.9%) identified podoconiosis as infectious disease. Profession, address of health facility, service year and attitude of participants were significantly associated with knowledge towards podoconiosis. More than half (56%) had favorable attitude towards podoconiosis patients. Knowledge score (95%CI: 1.389, 4.059, p-value = 0.002) was the independent predictor for attitude status. Very few (11.6%) respondents treated podoconiosis patients. Age group 45 years old and above and training on lymphedema morbidity management and disability prevention were significantly associated with clinical experience in treating affected patients, (AOR = 17.345; 95%CI: 4.62, 65.119) and (AOR = 7.385; 95%CI: 2.5, 21.797), respectively.

Conclusion: Despite, high percent of good knowledge of health professionals towards podoconiosis, clinical experience of health professionals in treating podoconiosis patients was very low. In-service trainings will be given for health professionals to improve treatment. In podoconiosis endemic districts hygiene supplies and other referencing materials should be made available for podoconiosis case management.

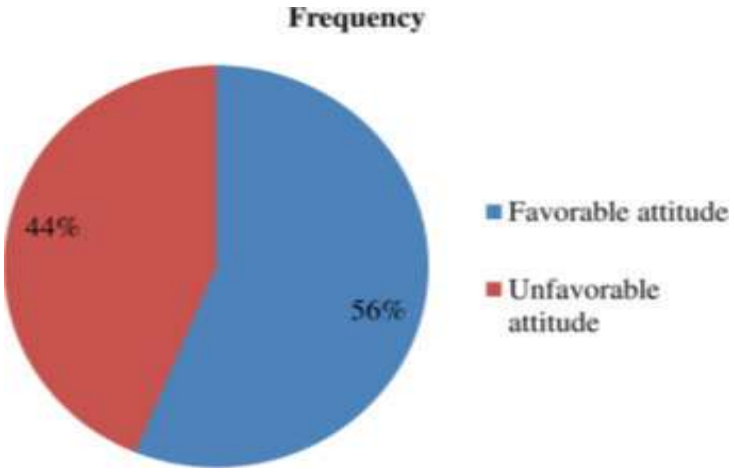

Fig. *Attitude of respondents towards podoconiosis patients in Gamo zone Southern Ethiopia, 2019*

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Application of enhanced multi-element geochemical signatures, primary and secondary geochemical haloes for vectoring into mineralized zones and delimiting exploration targets: A case study from the Serenu deposit, SE Iran

Farhang Aliyari[1], Saeid Shokri[2], Mohammad Lotfi[2], Tohid Yousefi[3] and Mohammad Hashem Emami[2]

[1]Faculty of Mining Engineering, Urmia University of Technology, Iran
[2]Research Institute for Earth Sciences, Geological Survey of Iran, Iran
[3]Department of Geology, Faculty of Sciences, Urmia University, Iran

The main application of multi-element geochemical data, primary and secondary geochemical haloes is to delimit the exploration targets as vectoring to mineralized ore bodies in porphyry deposits. A GIS-based expected value function and fuzzy operators was applied to integrate the different geochemical layers into a single model for delimiting and generating exploration targets. In addition, the primary and secondary geochemical haloes was correlated for recognition favorable areas. The comparison of fuzzy operators and expected value function with combined primary and secondary geochemical haloes demonstrated that the integrated fuzzy and GIS-based values functions are more efficient for generating a stronger geochemical evidence layer. It can be concluded that the simultaneous utilization of all input variables by the integrated fuzzy operators and expected value function is the main reason for the efficiency of those algorithms relative to single correlative geochemical haloes. These techniques was assessed by using a stream-sediment and lithogeochemical data set for prospecting porphyry Cu-Mo deposits in the Serenu deposit, southeastern Iran.

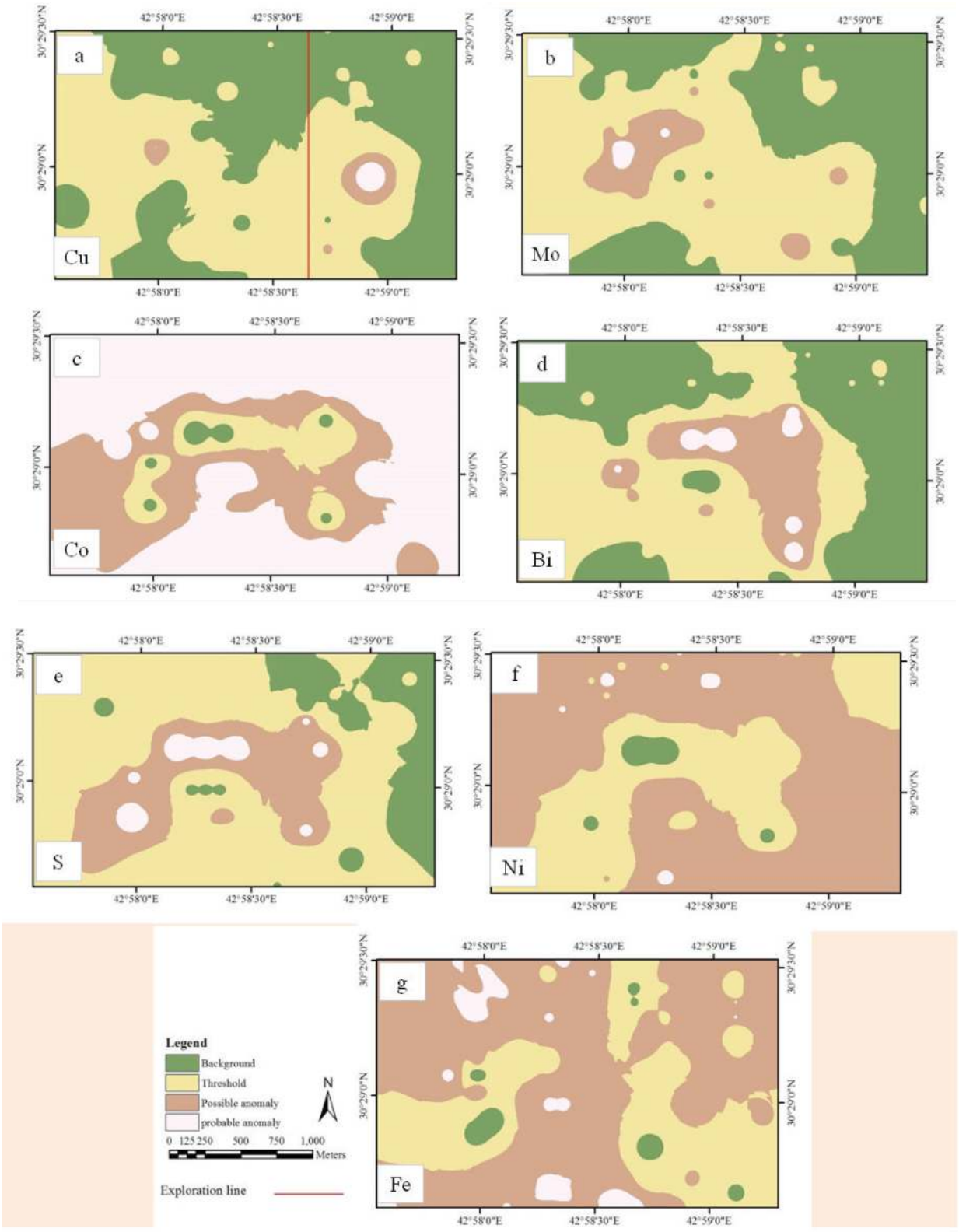

Fig. 1. *The integrated geochemical anomaly map of the erenu porphyry deposit*

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The utility of participatory geographic information systems in the assessment of flood vulnerability in a local community setting

Felix N. Buba
African Regional Centre for Space Science and Technology Education in English, Obafemi Awolowo University Campus, Nigeria

Participatory Geographic Information Systems (PGIS) integrates local knowledge (perceptions and experiences of people) with conventional scientific knowledge, and has been employed in many areas of development research and application. Researchers and flood managers in Nigeria have largely ignored PGIS approaches, employing mainly a reactive, top-bottom post-flood strategy of relief and rescue. This study employed PGIS to conduct a flood vulnerability assessment in some local communities in Lokoja, Nigeria, which experience seasonal flooding with devastating consequences. The objective was to integrate the people's perception and experiences with conventional science to investigate their vulnerability to flooding. Datasets utilized include Landsat imageries, digital elevation model (DEM), and soil samples. Spatial multi-criteria evaluation using the analytical hierarchy process was employed to analyse flood parameters determined through community participation to evaluate vulnerability while consistency ratio was also calculated to ensure that the comparison of criteria made was consistent. Results revealed that elevation is the most important factor, and land use, among other parameters of flood vulnerability. Out of a total area of 6, 258 Ha, 4, 445 Ha are highly vulnerable and 1, 815 Ha being moderately vulnerable. Comparison consistency ratio was determined to be 0.08 which is acceptable. Based on the results, this study concludes that the perception of affected communities can complement conventional flood research for a more effective response and mitigation strategy. The research therefore recommends the integration of geospatial techniques and participatory approaches for flood vulnerability studies for a proactive, bottom-up approach to flood management.

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Impact of anthropogenic disturbances on the avifaunal community in a protected area of central India

Fergus Mark Anthony and Garima Tiwari
Department of Forestry, Wildlife & Environmental Sciences, Guru Ghasidas Vishwavidyalaya, India

This study was carried out to investigate the effects of anthropogenic pressure on the avian community in the Achanakmar Tiger Reserve. The Achanakmar Tiger reserve has reported 246 avian species (Chandra et. al. 2018). The Tiger Reserve is part of the Achanakmar-Amarkantak Biosphere Reserve the only interstate biosphere reserve in Central India, located in an ecologically diverse and least disturbed landscape representing Tropical Dry and Moist Deciduous forests on Deccan Peninsular biogeographic region of the country, covering the states of Chhattisgarh and Madhya Pradesh (Roychoudhury et al., 2016).The Achanakmar Tiger reserve has been declared as an Important Bird Area for better monitoring and conservation by Birdlife International. Line transects of 0.5 to 1.0 km were systematically laid out and a minimum distance of ~300 m between transects was established to avoid double counting (Bibby et al. 1998). Different disturbance variables were measured viz. Sound pressure, Human settlement and Human trails along with Impact matrices.

There was no significant difference in the avian species richness and abundance between disturbed and undisturbed sites. But the community composition of birds in forests was distinct from that in the disturbed areas as those areas were dominated by only a few species. Thus, our study indicates that anthropogenic pressure can have a significant impact upon bird diversity and species composition in forests. For a healthy avian community conservation of forests with continuous canopy cover should be prioritized and more ecological research is needed to improve the knowledge on the effects of such disturbance on the avian community.

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Implementation gaps in forest management prescriptions and noncompliance in forest regulations in Ghana: Case study of four forest reserves

F. Ankomah[1], B. Kyereh[2], W. Asante[2] and M. Ansong[2]

[1]Timber Validation Department, Forestry Commission, Ghana

[2]Faculty of Renewable Natural Resources, Kwame Nkrumah University of Science and Technology, Ghana

In spite of the provisions of forest management prescriptions for forests in Ghana, forest degradation and deforestation are very high. This paper contributes to the discourse on sustainable forest management in Ghana by documenting the gaps in the implementation of forest management prescriptions and forest users' compliance with forest regulations. We used desk study, field observations and measurements, interviews as well as focus group discussions to solicit for information from different stakeholder groups. The study showed major gaps between the application of official forest management prescriptions and their practical implementation, as well as lack of compliance of logging regulations. These gaps encouraged forest encroachment, illegal exploitation of wood and wood products and undermine the effective generation of forest management data for planning and forest management decision support. Furthermore, poor compliance to management regulations was noted to constitute a critical factor limiting the achievement of forest management objectives. Reasons assigned to these gaps reflect institutional weaknesses and the constraints of resource under which such institutions operate. Therefore, as Ghana implements forest management mechanisms such as the Forest Law Enforcement, Governance and Trade and Reducing Emissions from Deforestation and forest Degradation (REDD+), attention should be focused on factors hindering the implementation of management prescriptions and compliance with forest regulations.

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Insecticide resistance management issues in India

G.M.V. Prasada Rao
Regional Agricultural Research Station (RARS), ANGR Agricultural University, India

In the continuous process of mutual evolution between plants and various organisms that feed on them, the host plants have evolved defensive mechanisms exploiting weaknesses in the attacking organisms. In turn, the attacking organisms have evolved mechanisms that enable them to detoxify or otherwise resist the defensive chemicals of their hosts. Thus, the gene pool of most of our pest species already contains genes that enable the pests to degrade enzymatically or otherwise circumvent the toxic effect of many types of chemicals that we have developed as modem pesticides. These genes may have been retained at various frequencies as part of the species' genetic memory. The best-documented evolutionary trait threatening crop protection is resistance to pesticides, which has frequently led to the loss of valuable chemicals and uncontrollable pest problems throughout the world, including India. Resistance occurs in thirteen orders of insects, yet more than 90% of the arthropod species with resistant populations are; Diptera (35%), Lepidoptera (15%), Coleoptera (14%), Hemiptera (14%), and mites (14 %). The disproportionately high number of resistant Diptera reflects the intense use of insecticides against mosquitoes that transmit diseases. Agricultural pests account for 59 percent of harmful resistant species while medical and veterinary pests account for 41%. There are several important management concerns related to agriculturally important insect pests. This manuscript deals with Insecticide Resistance Management issues in India.

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Performance analysis of planar Heterojunction Perovskite solar cell

Gaurav Kumar and **Jaspinder Kaur**
National Institute of Technology, India

Perovskite Cells have attracted appreciable importance from many researchers in the recent decade due to its reduced thickness, very less fabrication cost, and impressive photovoltaic performance. In this work, the authors investigated the simulation-based performance analysis of solar cells with perovskite CH3NH3PbI3 material. In the given paper authors have proposed the design of SnO2 (electron transport layer)/ CH3NH3PbI3 (active layer)/ SiGe and Spiro-OMeTAD (Hole Transport Layers)/ SiGeSn (Backplane) based solar cell may be grown on the glass substrate. The simulation of the predicted device is compared with the already existing perovskite solar cell performance parameters and comparatively higher conversion efficiency was obtained for the proposed structure. In this proposed work, the consequence of perovskite layer thickness, different doping concentrations of perovskite (active) layer, hole transport layers (HTLs), Ge mole fraction of SiGe hole transport layer, hole mobility of Spiro-OMeTAD layer and backplanes on the characteristic performance of the proposed solar cell have been analysed. The maximum conversion efficiency of 28.57% is reported for the given structure, having an amalgamation of two non-identical hole transport layers which ensures considerable photon conversion efficiency. Hence, this current work would propose a stepping stone in the advancement of high-performance perovskite photovoltaic cells in comparison with the pre-existing ones.

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Efficiency of CH4N2S-modified biochar derived from potato peel on the adsorption and fractionation of cadmium, zinc and copper in contaminated acidic soil

G. Rahimi and **L. Gholami**
Soil Science Department, Faculty of Agriculture, Bu-Ali Sina University, Iran

The objective of this study was to investigate the characteristics of potato peel biochar (PPB) and modified potato peel biochar (MPPB), and their effects on the adsorption and fractionation of some heavy metals in contaminated acidic soil. The results showed that the modified potato peel biochar has a higher pH, cation exchange capacity (CEC), surface functional groups, oxygen/carbon (O/C), and hydrogen/carbon (H/C) ratios than the PPB. The addition of modified biochar to soil, especially at the application rate of 8 %, increased soil pH, CEC, and organic carbon (OC). The maximum adsorption capacity values of Cd, Zn, and Cu in the soil amended with MPPB at the application rate of 8 % were 5142.63, 3508.44, and 4993.12 mg kg-1, respectively. The addition of MPPB to the soil transformed the unstable fraction (soluble and exchangeable) of heavy metals to stable fractions (Fe/Mn oxides–bound, organically–bound, and residual). Compared to the control treatment, the soluble and exchangeable fraction of Cd, Zn, and Cu in soil amended with 8 % MPPB decreased to 102.97, 94.4, and 76.18 mg kg-1, respectively. The order of increment of organically–bound and residual fractions of heavy metals in soil amended with 8 % MPPB were Cu > Cd > Zn and Cd > Cu > Zn, respectively. The results of this study showed that MPPB can be used as a low-cost and eco-friendly adsorbent for the immobilization of heavy metals in contaminated acidic soils.

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Geological interpretation using multivariate K-Means and robust factor analysis in Dezak area, SW Iran

Ghazal Haj Najafi[1], Alireza Jafarirad , Peyman Afzal[2] and **Seyed Jamal Sheikh Zakariaee[1]**

[1]Department of Geology, Science and Research Branch, Islamic Azad University, Iran
[2]Department of Petroleum and Mining Engineering, South Tehran Branch, Islamic Azad University, Iran

The Dezak limestone area, located SW Iran, is a potential site for industrial survey project of Precipitated Calcium Carbonate (PCC). Economic geology studies and geochemical implications of the area involve a high-risk level given the high purity of the limestone and the amount of penalty elements in the deposit. Generally, considering the compositional properties of geochemical data and using multivariate methods for a total of 527 composite samples showed that the data can be classified into five classes based on geological characteristics. According to K-means analysis, the grades of $CaCO_3$ and SiO_2 were 96.066% and 1.4754% within the second zone, and 94.5914% and 2.3278% within the fifth zone, respectively. Therefore, these zones were recognized as the first and second highest priorities having in common 165 and 133 samples on the specific geological units of Kd^{l} and Kd^{ld}, respectively. Geochemical classification confirmed the geological units and variations. The priorities may preferably change depending on the time, place, plant requirements, access position, and the concentration of MgO and SiO_2. Results from the robust factor analysis indicated that $CaCO_3$ enrichment was mainly associated with depletion of SiO_2 and Fe_2O_3 as well as P_2O_5 and, to some extent, MgO. This indicates the suitability of the selected study area, as major penalties are in contrast to $CaCO_3$ enrichment. Geological and geochemical studies suggest different types of crystallized limestone and micritic limestone as the best zones for extraction. Therefore, geological properties were verified using multivariate K-means and factor analysis in the Dezak area.

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Assessing groundwater quality in per-urban Accra, Ghana: Implications for drinking and irrigation purposes

G. B. Hagan[1], R. Minkah[2], G. A. B. Yiran[3] and E. Dankyi[4]

[1]Department of Physics, University of Ghana, Ghana
[2]Department of Statistics and Actuarial Science, University of Ghana, Ghana
[3]Department of Geography and Resource Development, University of Ghana, Ghana
[4]Department of Chemistry, University of Ghana, Ghana

In many developing countries, cities are faced with rising water demand due to rapidly increasing population, inadequate municipal water supply and growing sanitation pressure. Consequently, groundwater resources are being heavily relied on to meet the growing demand. Nonetheless, the long-term sustainability of groundwater supply and its quality is threatened by multiple anthropogenic pressures. This study assessed the quality and suitability of groundwater in peri-urban communities in Accra, the capital city of Ghana for domestic and irrigation purposes. In this regard, thirty-six (36) groundwater samples were analysed for physico-chemical parameters including pH, total dissolved solids, electrical conductivity, and ions including nitrates and chlorides. The water quality index (WQI), sodium absorption ratio and relevant statistical plots were employed in assessing the quality and suitability of the groundwater for domestic and irrigation purposes. The results indicate that for most samples, almost all parameters measured were within the WHO recommended limits for drinking water. This is reflected in the classification of 92% of water samples as good or excellent quality for domestic purposes using WQI. The results show that the abundance of ions in groundwater as: Na+ > Ca2+ > Mg2+ > K+ for cations and Cl– > SO42– > HCO3– > F– > NO3– for anions. Principal component and hierarchical cluster analysis identified mineral dissolution and anthropogenic activities as the main factors influencing groundwater chemistry in the study area. These factors resulted in mixed water types, viz. Na-Ca-Mg-Cl and Na-Ca-Mg-SO4, and Na-Cl as the dominant water type. Classifications based on the Wilcox and USSL diagrams suggest that groundwater in the study area is generally suitable for irrigation. Given that these boreholes are new, the results from this study generally reflect background levels and have implications for groundwater development and management in the rapidly developing capital of Ghana.

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Sustainable and 'smart' restructuring around the making of mega and world-class cities in India: A critical review

Gunjan Chowhan, Amrita Sen and **Jenia Mukherjee**
Indian Institute of Technology, India

COVID-19 has posed newer questions on urban vulnerabilities in India and showcased the importance of acting effectively towards a vision of sustainable urbanization. Several studies during the pandemic explored the need to make cities socially inclusive and ecologically resilient. The Indian Smart Cities Mission is the flagship urban project that envisions economic growth and ensures technology-induced quality of life in tune with global city-making projects like eco-city, world-class city, green city, etc. In this paper, we critically examine a range of such urban projects and explore the extent to which these cities in their 'smart' restructuring embrace a holistic vision of sustainability. We analyse three urban renewal projects: the Lavasa eco-city, the Rajarhat green-city, and the Dholera smart city, arguing why a case-study based approach is significant to study the connection between policy promises and actual socio-environmental realities. Our empirical explorations reveal that processes and practices involved in the making of these projects are 'utopian'; in reality, they tend to uproot the existing urban ecological buffers, critically impacting the quality of urban life across classes. Beyond the capitalist logic of 'accumulation by dispossession', we finally lay out the need to imagine urban commons as scripted with memories, desires, plurality of use, users, and ways of living, and thus to situate the urban planning in practical visions of sustainability and environmental resilience.

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Amelioration of organic carbon and physical health of structurally disturbed soil through microbe-manure amalgam

H. Shahzad
Pakistan Agricultural Research Council Arid Zone Research Centre, Pakistan

Less precipitation, high temperature, and minimal natural vegetation are characteristic of regions having arid climate. The harsh environment massively destructs the soil structure of that area by burning soil organic carbon, leading to deteriorated soil nutritional quality, creating a huge threat to agricultural production and food security. Direct application of organic wastes not only substitutes lost organic carbon but also restores soil structure and fertility. Organic amendments i.e., farm manure (FM), poultry manure (PM), molasses (MO) and Exo-Poly Saccharides (EPS) producing rhizobacterial strains i.e., M2, M19, M22 amalgams were used as treatments. To assess the impact of treatments on soil carbon and structure restoration to hold more water and nutrients, a 42-day incubation experiment using completely randomized design (CRD) under the two-factor factorial arrangement was conducted. Macro aggregation (0.25 to >1 mm), carbon retention in macroaggregates, active carbon (dissolved organic carbon, a mineral associated organic carbon, microbial biomass carbon), total organic carbon, the carbon mineralization activities, and water retention capacities were observed highest in soils that were treated with (FM+M2, FM+M22, PM+M19, and MO+M19). Finally concluded that organics mineralization by microbial actions release organic glues that not only imparts particle aggregation but also conserve organics as aggregate entrapped carbon. Amalgamated application of microbe-manure combinations directly impacts soil structure and organic carbon contents, but in an indirect scenario it improves fertility and productivity of soil.

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Potential fields study in the NW of Algeria: Evidences of active faults and underground structure

Hassina Boukerbout, Boualem Bouyahiaoui and **Abdeslam Abtout**
Centre de Recherche en Astronomie, Astrophysique & Géophysique-Observatoire d'Alger. (C.R.A.A.G.-Observatoire d'Alger.), Algeria

The NW of Algeria is known as one of the seismic active zone in Algeria and the West Mediterranean region. It constitutes a key area to study neotectonics structures and their geodynamical context. Until now, there is a little information about existence of deep active faults, which generate this strong activity. Potential fields data (aeromagnetic and gravity) are an important resource of information on crustal structure. The aim of this work is giving a reliable geometry of the major faults relative to the kinematics of this region. The results obtained from various filtered maps (shaded relief, derivatives, upward continuation) of the magnetic and gravity data were used to generate a structural map of the studied area. Whilst the continuous wavelet and ridgelet transforms can help in automatic detection of elongated structures in 3-D both onshore and offshore, to estimate their strike direction, shape and depth. The short wavelength potential fields anomalies are related to volcanic rocks on the coast and to the basement in sedimentary basins. The long wavelength anomalies are associated mainly with deep E-W structures, limiting the basins. In the North, similar structures have been identified in the Mediterranean Sea. This work yields to 2-D and 3-D image of the region and confirms the existence of several faults, localized or inferred, from former geological studies.

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Friction coefficient equation in a gravel bed under bedload regime using the dimensional analysis

H. Toufik
Bordj Bou Arreridj University, Algeria

The wadis in Algeria organize the beds as gravel by transporting fine sediments form through hydrosedimentary dynamic of intermittent flood events along the time. In this paper, a new flow resistance equation is proposed for gravel bed bedload regime. Due to the field measurements lack in wadis, the study is based on 2147 flume data with friction factor measurements. The development of convenient equation is achieved through theoretical analysis by taking into account wadi dominant parameters based on dimensional analysis. Hence, deduced relationships are considered between friction coefficient f, the flow characteristics, bed grains size, geometric parameter and bed slope. The proposed equation gives satisfactory results; the estimated mean normalized error is less than 17%.

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Examining the streets of Kabalagala's CBD using crime prevention through environmental design (CPTED)

Hillary Shiverenje Songole
Makerere University, Uganda

Developing countries should explore other avenues apart from the traditional approaches of crime prevention mainly involving the criminal justice and social approaches of crime prevention that may assist in arresting crime amid resource constraints and predicted increase in population. This paper evaluates the streets of Kabalagala township Located in Kampala City, Uganda using a Defensible Space checklist and assess the perceptions of property/business owners concerning property crimes at the street level. The findings indicated that the streets of Muyenga, Gaba and Kikubamutwe were impacted by the existence of isolated areas and concealment opportunities and presented signs of poor maintenance and management of street elements which may have adversely affected effective natural surveillance and attracted criminal activity.

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A fully coupled atmosphere-hydrology modeling framework to simulate extreme hydro-meteorological event: A case study of Kodagu 2019 flood event over India

S. Himesh and **S. Sarkar**
CSIR Fourth Paradigm Institute, India

The adverse impacts of Global Climate change are perceived to be contributing to the increased number extreme weather events like heavy rainfall and floods, thus resulting in loss of lives and properties. In the recent past, many parts of India are witnessing such events. One such event happened over the Kodagu district of Karnataka, India, is considered in this study. The uncertainty associated with the onset-time and the spatial distribution of the heavy rainfall events require an improved understanding of the land-atmosphere feedbacks at higher spatial scales. A well-calibrated, validated, and optimized coupled atmospheric-hydrological modeling system with a very high-resolution can be one of the best tools for the reliable prediction of such events with sufficient lead. The accurate forecast of such hydro-meteorological events go long way in protecting lives and properties of the people. The hydrological module of the WRF-Hydro compensates and strengthens the description of the lateral transport of the infiltration excess process and of the saturated subsurface process in the existing Land surface model (LSM). The fully coupled model is realized by recompiling and merging WRF-Hydro into the mesoscale atmospheric model WRF. The fully coupled WRF-(Hydro/WRF) configuration modulates the spatial distribution of the soil moisture, precipitation, and the evapotranspiration, by means of recycling the surface and subsurface runoff (lateral terrestrial flow). Sensitivity studies involving the land-surface and subsurface feedbacks for a tropical humid region with complex physiographic settings (presence of complex topography) under monsoon regimes (strong synoptic forcing) are lacking. Therefore, in the present study, a fully coupled WRF-(Hydro/WRF) modeling framework with convective permitting grid-scale is used to simulate the hydro-meteorological conditions during an extreme rainfall event (08–09 August 2019). The fully coupled model contributes to a better simulation of the soil moisture content, due to the computation of the lateral redistribution and re-infiltration of the water; the improved simulation of the soil moisture improves the computation of the sensible and latent heat fluxes and thus eventually improves the accuracy the prediction of precipitation.

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Application of space series analysis to compare the effect of cultivation management on soil properties in adjacent fields

H. Asadi[1], S. Marzvan[2] and **L.C. Timm[3]**
[1]*University of Tehran, Iran*
[2]*University of Guilan, Iran*
[3]*Federal University of Pelotas, Brazil*

The comparison between adjacent fields in order to evaluate the effect of different managements on soil properties is questionable due to ignoring the soil spatial variability. Our aim was to develop a methodology based on improved space series to differentiate between spatial variability of soil properties and the effect of tillage management in adjacent fields. The study was carried out in a rainfed sloping area consisting two adjacent fields of different tillage direction, i.e. up-down tillage (UDT) and contour tillage (COT). Soil sampling was performed at 80 (40+40) points of 5 m intervals along a straight line at the mid-slope position. All soil properties of UDT were significantly ($P<0.05$) different from those of COT compared by independent sample T test. But this analysis could not differentiate between the spatial variability of soil and the changes induced by tillage type. We tried to determine the net effect of UDT on soil properties in comparison with COT in the same field. To do this, we (i) performed space series analysis on COT data, (ii) used autoregressive, moving average and autoregressive-moving average models to model the space series data on COT field, and (iii) used the best model obtained for each soil attributes on COT to forecast the value of the property in ten adjacent points in the UDT field. Comparison between the forecasted and measured data in UDT showed that the evaluation of tillage direction effect on soil attributes based on comparison between adjacent fields can be over or under estimated when the sampling coordinates and the spatial correlation among adjacent observations of data are ignored. The methodology used was able to differentiate between natural and management induced differences of soil attributes. Overall, the use of this methodology will improve the prediction and understanding of the effects of different cultivation practices on soil quality.

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Impacts of land use/ land cover dynamics on land surface temperature using geospatial techniques in Anger River Sub basin, Western Ethiopia

Indale Niguse Dejene[2], Mitiku Badasa Moisa[1], Biratu Bobo Merga[3] and **Dessalegn Obsi Gemeda[4]**

[1]Department of Agricultural Engineering, Faculty of Technology, Wollega University Shambu Campus, Ethiopia

[2]Department of Earth Sciences, College of Natural and Computational Sciences, Wollega University Nekemte Campus, Ethiopia

[3]Department of Geographic Information System, Institute of Land Administration, Oda Bultum University, Ethiopia

[4]Department of Natural Resource Management, College of Agriculture and Veterinary Medicine, Jimma University, Ethiopia

Land surface temperature (LST) is increasing due to land use land cover (LULC) conversion in the world. Global warming was caused by highly expansion of agricultural land, expansion of human settlements and removal of vegetation cover. Here, we analyzed the impacts of LULC dynamics on LST from the year 1991 to 2020 in the Anger River Sub-basin, western Ethiopia. The LST and LULC changes were derived from thermal infrared and multispectral band of Landsat 5 TM (1991), Landsat 7 ETM+ (2003) and Landsat 8 OLI/TIRS (2020), respectively. The LULC map of the study area was produced using the supervised classification method with the maximum likelihood algorithm. Our study results revealed that agricultural land was increased by the rate of 30.4 km2/year. Between 1991 and 2020, about 650.3 km2 of grassland was converted to agricultural land while 305.4 km2 was converted from forest to agricultural land. The mean minimum LST was 21.2 °C in 1991 and increased to 23.50 °C and 26.80 °C in the years 2003 and 2020, respectively. Thus, the mean LST of the study area was increased by 5.6 °C between 1991 and 2020. Consequently, the conversion of LULC is the main factor for the increment of the LST. The LST was highly increased when forestland and grassland were converted to agricultural land. Similarly, when forestland was converted to bare land, the LST was increased. Our results suggest the need for environmental protection to respond to the increasing trend of LST and rapid conversion of LULC change in the study area.

Alleviating effects of salicylic acid spray on stage based growth and antioxidative defense system in drought stressed two rice (Oryza sativa. L) Cultivars differing in drought tolerance?

I. Hussain and **Asma**
Department of Botany, Government College University, Pakistan

In developing countries such as Pakistan, agricultural production is dependent on irrigation access to water within an exact time period in crop rotation programs. Pakistan is a country that is often affected by drought stress. Approximately 33% of the arable land around the world has been found to be vulnerable to drought, which is a very serious issue affecting the yield and productivity of cereal crops. Therefore, the present study was executed to study rice (Oryza sativa L.) genotypes HTT-138 and HTT-39 under various levels of drought i.e., control flooded (CF) as recommended for rice (control), control saturated (CS) 100% field capacity (FC), 80% FC and 60% FC with or without the application of salicylic acid (100 mgL-1). Results from the present study demonstrated that increasing levels of drought stressed in the soil caused a significant decrease in plant growth and biomass, photosynthetic efficiency, induced oxidative damaged to the membrane bounded organelles and imbalance the nutritional status of the plants, compared to the plants grown in the control flooded soil. In addition, drought stressed conditions also affect the antioxidant capacity of the plant with the non-enzymatic compounds which were also affected due to water deficit environment. We also demonstrated that HTT-138 showed more tolerance to the drought stress then HTT-39 under same levels of water stress in the soil. Although, negative impact of drought stressed environment can ameliorate by the application of SA, which not only increased plant growth and composition but also increased nutritional status of the plant by de-creasing the concentration of reactive oxygen species (ROS) in the membranous bounded organelles. In conclusion, the application of SA is useful to enhancing plant growth and composition in cereal crops, when grown in abiotic stress environment.

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Wood fuel producers' insight on the environmental effects of their activities in Ghana

J. Alhassan, A. Ofosu, S. Iddrisu and **E.K. Garsonu**
Kwame Nkrumah University of Science and Technology (KNUST), Ghana

Drawing on a qualitative approach, this paper examines wood fuel producers' insight on the environmental effects of their activities in the forest region of the Kintampo North Municipality of Ghana. Forty-eight (48) wood fuel producers were sampled from the Babatukuma, Gulumpe, and Dawadawa communities in the Municipality to participate in the in-depth interview using snowball-sampling technique. The recorded in-depth interviews were transcribed into English and analyzed thematically based on manual analysis. Results indicated that wood fuel producers have no option than to engage in the activities of charcoal production and fuel wood collection due to absolute poverty, unemployment, and the need for energy for cooking and heating. However, producers of wood fuel do not establish their plantations for wood fuel extraction; rather depend on the natural forest for their extraction. This resulted in environmental effects including deforestation, forest degradation, and loss of biodiversity. Since the current state of wood fuel extraction presents dire environmental consequences to the forest resources, we recommend Forestry Commission and the Municipal Assembly initiate tree planting exercises to make wood fuel a sustainable energy in Ghana. Poverty reduction programs such as Livelihood Empowerment against Poverty (LEAP) targeted at supporting inhabitants who want to engage in other forms of livelihood activities including shear butter processing to alleviate them from absolute poverty are strongly recommended. This will help reduce their over-dependence on the forest resources for survival in addition to curbing environment effects of their activities.

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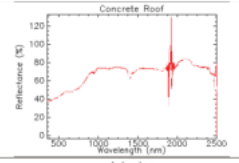
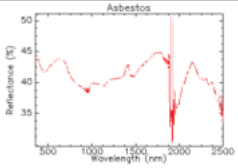
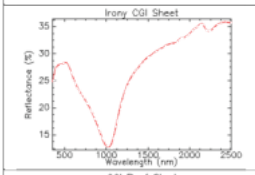
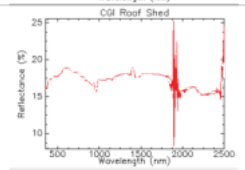
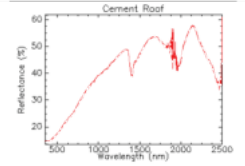
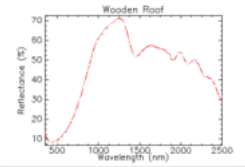
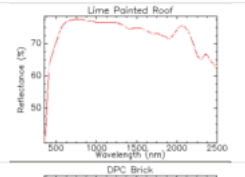
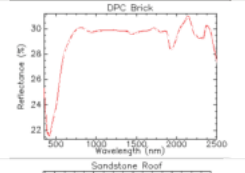
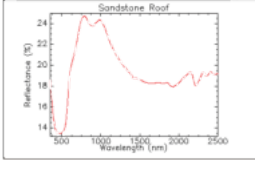
Spectral library creation and analysis of urban built-up surfaces and materials using field spectrometry

Kailash Chandra Tiwari and **Dwijendra Pandey**
Delhi Technological University, India

Hyperspectral remote sensing data by virtue of its capability to discern between different types of urban construction materials and surfaces is extremely useful in the study of various urban impervious surfaces and its effect on urban environment. There are a variety of urban built up materials and surfaces that can be distinguished only by using their comprehensive spectral characteristics. This paper presents a study that deals with creation of spectral libraries and statistical analysis of spectral signatures of urban built-up surfaces and materials. Field measurements have been carried out using Spectro-radiometer over the wavelength range of 350 to 2500 nm. Further, this study investigates the unique spectral characteristics and complexity of heterogeneous urban environments using mean spectral signatures of major built-up surfaces and materials. The study area belongs to the Udaipur, Rajasthan, India, which is an amalgamation of urban built-up and non built-up surfaces. Although the spectral libraries have been created for Roof/Building, Roads/ Pavements, Railway Track, Sports Infrastructure etc, spectral signatures of only Roof /Building surfaces are shown here in the Table – 1 below. The results of the analysis suggest that various built-up surfaces and materials can be identified by investigating different absorption features in different spectral regions of a particular urban built-up class. The analysis of pervious / non built-up surfaces can be further enhanced by adding some more parameters in spectral characterization of the material. Besides, significant wavelengths can be identified by analysing the absorption features present in the spectra of different materials and the same may be utilised for mapping and area estimation of a particular type of built up material and/or surface.

Table - 1 Spectral library creation and analysis of roof surfaces

Spectral Signature	Observation
	The reflectance is almost constant in all the regions except in visible. Some small absorption features due to metallic component and hydrocarbons are observed in visible, VNIR, and FSWIR regions, respectively.
	In visible and FSWIR, the response is almost concave with some major peaks. The reflectance decreases from visible to VNIR, while having sinusoidal behavior in FNIR. The response is almost constant in ESWIR. Further, iron oxide and hydrocarbon absorption features dominate in VNIR, FNIR, and FSWIR regions, respectively.
	In fresh CGI sheet, response is almost constant in all the regions, which has some absorption features near 1020, 1250 and 2250 nm.
	In irony CGI sheet, the reflectance decreases from visible to VNIR while it increases from VNIR to FSWIR with a major absorption near 1050 nm. A minor absorption also appears near 2250 nm.
	The spectral response of cemented roof surface increases from visible to FNIR while having sinusoidal behavior in ESWIR and FSWIR regions. It has a major peak in FSWIR with some minor absorptions in FNIR.
	There is a sudden increase in reflectance from visible to VNIR and FNIR while behaves as a decreasing sinusoid in all the other regions with different peaks and absorptions.
	The reflectance is high and almost constant in all the regions with different peaks and absorptions in FSWIR. Some minor absorptions also appear in VNIR and FNIR regions.
	Spectral signature of DPC brick is almost constant in all the regions with a peak and major absorption in FSWIR. Further, some minor absorptions are observed in visible, FNIR and ESWIR regions.
	The response of sandstone roof increases from visible to VNIR while decreases from VNIR to ESWIR and almost constant in FSWIR regions. Some absorption features are observed near 890, 2250 and 2390 nm.

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The impact of productivity improvement approach using lean tools in an automotive industry

Krishna Veer Tiwari and **Satyendra Kumar Sharma**
Birla Institute of Technology & Science, India

In today's competitive environment, as manufacturing industries face additional pressure to meet the dynamic nature of customer demand, lean manufacturing is an essential tool to reduce this burden to a great extent. Various lean methodologies exist like value stream mapping, 5S, Kaizen, line balancing, just-in-time, poka-yoke, Kanban, total preventive maintenance, and single-minute exchange of die, which are currently being implemented in industries for the improvement of productivity and reduction of overall cycle time. The study discusses the importance of combining value stream mapping and line balancing techniques using existing literature and is validated by a case study on an automotive component manufacturing industry's assembly line. In the past, lean tools have been criticized for being static tools due to a lack of measurable output due to the implementation of the techniques. In this study, the real-world performance of value stream mapping allows for clear understanding and accurate prediction in terms of cost and time savings achieved using lean tools. Value stream mapping is a highly beneficial lean tool for industries with constrained resources to assess the considerable gain lean tools would provide and how the long-term investment would be beneficial to offset non-value adding activities. The empirical validation shows a reduction of the overall time cycle by 20.28% and a gain in the number of units produced by 46.16%. The results also demonstrate that an increase in productivity by eliminating waste (through value stream mapping) and modifications in the layout and assigning an appropriate number of workers (through line balancing) is possible after careful assessment.

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Impact of implementation of CMMS for enhancing the performance of manufacturing industries

Lakshmi Shankar
Department of Mechanical Engineering, Punjabi University Patiala, India

Maintenance is inevitable in any industry because failures due to maintenance affects the performance of Industries badly. Therefore, the functionality of maintenance is enhanced considerably and automated by the implementation of a Computerized Maintenance Management System (CMMS) in an organization. CMMS is a maintenance-based software also known as Enterprise Asset Management (EAM) that is utilized to plan, schedule, manage, and monitor maintenance activities related to equipment, machinery, automobiles, or other facilities and services available in the industries. The application of CMMS in industries enhances the performance like increased productivity, increased organizational achievements, improved safety, health & environment, cost savings, and efficient use of resources in industrial sectors. The main objective of the paper was to explore the key performance indicators (KPI) for CMMS selection and benefits of the implementation of CMMS in Indian manufacturing industries through the survey method. From the existing literature, a structured questionnaire is developed to investigate the performance of CMMS in the manufacturing industries. The questionnaire was used for the data collection from the various manufacturing industries and the responses have been analyzed to determine the results. The study explored eleven KPIs for CMMS selection. Seven factors were identified as independent variables, while the remaining four factors were dependent variables. According to the findings, industries that had implemented CMMS in their premises benefited greatly from it.

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Urban form, building regulations and outdoor thermal comfort in the tropical city of Chennai

L. R. Amirtham[1] and **S. E. Horrison**[2]
[1]*School of Planning and Architecture, India*
[2]*Sathyabama Institute of Science and Technology, India*

Urban population in most of the global cities are constantly increasing. In India, this rapid growth has compelled local governments to revise planning regulations on a regular basis, with the goal of providing urban living more affordable. As a result, the built density was increased without considering the impact of such changes on human thermal comfort. The main aim of this study is to evaluate the impact of the resultant urban form of changing building regulations on the outdoor thermal comfort and intensity of heat island in Chennai. The study has three objectives: first, to determine the variance in urban heat island intensity over time using the traverse approach. Second, examine the performance of an urban neighbourhood's outdoor thermal comfort by determining the relationship between urban built form and microclimate parameters. Third, to understand the relationship between development regulations and urban morphology, as well as their impact on microclimate parameters and outdoor thermal comfort. The traverse survey conducted in the Chennai Metropolitan Area revealed a heat island

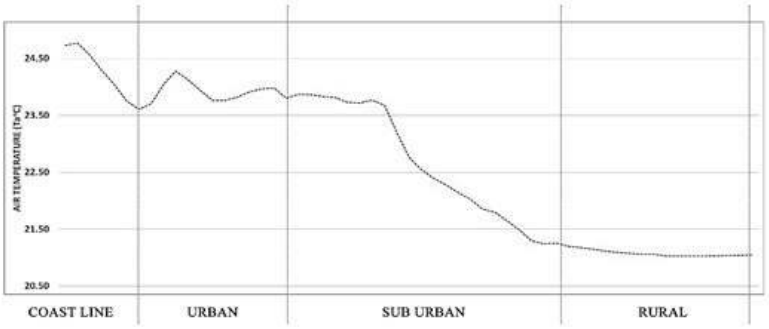

Figure 1: *Night time air temperature distribution in winter in Chennai Metropolitan Area*

intensity of 4.5°C in winter (figure 1) and 2.5°C in summer.

The research also investigated the impact of the existing urban form guided by the development control rules of Chennai Metropolitan Development Authority. The study found that the 2019 regulation improved the outdoor thermal comfort when compared to the existing built morphology in the urban neighbourhoods. The thermal performance of the 2019 regulation can further be enhanced through increasing the pervious layer in the setbacks by 50 percent with green cover and canopy trees. This research can aid urban planners and design professionals in the formulation of urban guidelines with appropriate urban form in Chennai city which mitigates urban heat island intensity and improves outdoor thermal comfort.

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Oysters indicators of climate change - case study: The palaeoenvironmental distribution of late Miocene oysters in the northwestern Algerian basins

L. Satour, M. Bessedik and **L. Belkebir**

Laboratory of Stratigraphic Paleontology and Paleoenvironment, Faculty of Earth Sciences and the Universe, University of Oran 2, Algeria

Understanding the various interactions of benthic organisms with their biotopes is a valuable tool for reconstructing the various parameters of marine palaeoenvironments (Videt et Néraudeau, 2002). Among the pteriomorphic bivalves, with calcitic shells, the ostreidae, due to the excellent preservation of their shells and the ubiquitous distribution of this group of mollusc, allowed to consider them among the most useful benthic marine organisms in the interpretation of palaeoenvironments (Videt et Néraudeau, 2002; Satour 2012)

The main aim of this work is to specify the Tortonian-Messinian oyster environments in the three Neogene Algerian basins (Lower Chelif, Tafna, M'sirda).

This study was made on the basis of shell material collected from eight sections, during several field trip missions (2002, 2003, 2004, 2005 and 2008). The distribution of oysters in the tortonian-messinian studied deposits is highlighted, taking into consideration the main parameters prevalent the establishment of oyster levels: sedimentary dynamics and basin tectonics (Videt et Néraudeau 2002). References on upper Miocene and current oysters in the Mediterranean region (Lecointre et Ranson 1961; Ranson 1941, 1949; Jiménez et al., 1991; Freneix et al. 1988..) allowed better consideration of the oyster palaeoenvironments interpretation of the neogene basins. The adopted bathymetric method is that of Pérès and Picard (1964).

New data have been brought about the late Miocene oyster palaeoenvironmental distribution in the northwestern Algerian basins. The analysis of ecological features of these oysters has shown the recurrent occurrence of four species of oysterids (Ostrea lamellosa offreti, Crassostrea gryphoides, Neopycondonte navicularis and Hyotissa hyotis). Alone or in association, they characterize deep environments of large calm circalittoral mud flats (Neopycnodonte navicularis), infralittoral environments with strong hydrodynamics (Crassostrea gryphoides), shallow environments (infralittoral-mediolittoral) with significant detrital inputs (Ostrea lamellosa

offreti) and reef to peri-reef contexts (Hyotissa hyotis). Tortonian oyster emphasizes the refreshment trend of the late Tortonian. The onset of the Tortonian cooling climate is marked by the implementation of a slightly displaced shell accumulation, containing two oysters: Ostrea lamellosa offreti (Kilian, 1889) and Hyotissa hyotis (Linnaeus, 1758). Crassostrea gryphoides (Schlotheim, 1913) confirms the cooling climate trend, with the reduced size of shells. Furthermore, the Messinian climate tendency is related to the diatomite extension and the 1st coral cycle. The large, deep circalittoral mud flats are succeeded by marly diatomites con fined environments. Climate conditions are warmer or even subtropical and characterize a peri-reefal to reefal environments.

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Import intensity of India's manufactured exports – An industry level analysis

Mahua Paul and **Ramaa Arun Kumar**
Institute for Studies in Industrial Development, India

India opened up her domestic market to global competition in early 1990s, however, it was in the early 2000s that the trade dynamics gained momentum with India actively entering into free trade agreements, both regionally and bilaterally. The period between 2000-01 and 2017-18 witnessed a surge in imports from $50 billion to $384 billion, respectively. One of the fallouts of import liberalisation policy was internationalisation of the production process. Import intensity of exports based on input-output tables for various years till 2013-14 reveals that rise in imported inputs in the export sector did not have a positive impact on exports. Secondly, the impact of these imported inputs led to a rise in the demand for skilled labour than the abundant less skilled labour that India possesses. In future trade negotiations, the heterogeneity of Indian industry should be an important consideration while negotiating trade deals to enable greater imports of intermediate inputs necessary to boost the productivity of exporting firms.

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Water resources management challenges and solutions in Balochistan, Pakistan

M.M. Akhtar

Department of Environmental Science, Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS), Pakistan

Water is the most essential component for survival of human along with their economic development. Balochistan, the largest province of Pakistan by area is confronting severe drought conditions and water scarcity along with water quality issues. This menace condition is badly affecting agriculture sector, Livelihood and community health. Balochistan is less equipped to cope up with the consequences of the catastrophic climatic variation. In the gross domestic product (GDP) of Pakistan, over 26% is shared by the agriculture sector by engaging 44% of the total labour force. An inadequate ephemeral surface is available due to steep slope. Therefore, groundwater is merely the option left for executing agricultural activities along with other livelihood activities in 90% of regional area across the province whereas 10% of the area encounters water logging with worst groundwater quality concerns. A very limited research work is conducted on the issues relevant to water because of socio-economic, political and security concerns. Previously conducted studies have illustrated that in the entire province the quality of groundwater is affected due to a large amount of pathogens and high concentration of various contaminants. It is revealed by the studies of Pakistan Economic Survey that over 50 million inhabitants don't have an access to safe water and 0.25 million children lost their lives across the country due to consumption of contaminated water. Approximately 72% of the rural residents of the province are dependent on streams and tube wells for their survival. This paper encompasses certain anthropogenic factors contaminating surface and groundwater including all other available resources of water. The best option to sustain water resources could be monitored the basin, develop hydrological modelling, and promote low delta crops. The stakeholders and active community participation along with serious and concrete measures could help to overcome water issues.

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Good Governance practices and competitiveness in cooperatives: An analytical study of Kerala Primary agricultural credit societies

Manisha Paliwal[2] and **K.K.Tripathy**[1]
[1]*Ministry of Coopration, India*
VAMNICOM, India

The cooperative societies play an important role in rural development and financing. The cooperative movement was started with a view to uplift agricultural operations. Among them, Primary Agricultural Credit Societies (PACS) are at the grass-root level of cooperative credit structure and form the largest number of Cooperative institutions in India. The performance of PACS entirely depends upon how it is being governed and the increasing size of PACS acts as an indicator of competitive enhancement. Thus, bringing good governance and its impression on competitiveness into the cooperative operating system. The study follows select PACS in Kerala and provides insight into their governance practices and its relationship with competitiveness. The study adopts a descriptive-analytical approach with a blend of primary as well as secondary data. The research study concludes that participation, accountability, and transparency are the effective pillars of cooperative governance in the presence of diversification strategy which further leads to improved competitive performance of Kerala's primary agricultural credit society. The competitive process led by good governance has been demonstrated as a key determinant for the growth and development of the cooperatives. The practices of PACS in Kerala enhance the reputation and stakeholder value of the firm in the long run. This further improves their productivity and enhances their capability to produce goods and services, which presents as a competitive growth. The study proves that the system of governance should not be rigid and imposed on firms, rather be flexible and adaptive to each situation.

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A review of MAC layer for wireless body area network

F. Manjot Kaur[1], S. Rohit Bajaj[2] and **T. Navneet Kaur[3]**
Chandigarh University, India

The Wireless Body Area Network (WBAN), which comprises of a set of tiny, invasive/ non-invasive, light-weight, high-energy-efficient biosensors that monitor human health for early diagnosis and therapy, has lately received a lot of interest from researchers. As present and rising tendencies in communications included with the tendencies in microelectronics and embedded system technologies. The existing techniques of IEEE 802.15.4 and IEEE 802.15.6 standards are explored in WBANs. As a consequence, discussed the challenges of MAC layer in WBAN. Secondly, different multiple access techniques along with TDMA, CSMA/CA, Slotted Aloha, and Hybrid are explored in terms of design goals. In literature, several of Medium Access Control (MAC) protocols for WBANs have been suggested for addressing the particular challenges associated with reliability, delay, collision and energy within the new research area. The design of MAC protocols is primarily based on multiple access techniques. Finally, the general parameters of some popular MAC protocols are highlighted as performance metrics of WBANs.

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A Near-Real Time monitoring system for Drought impact on croplands in Southeast Asia

Manjunatha Venkatappa
LEET Intelligence Co., Ltd., Thailand

While droughts have intensified in recent years, only a handful of studies have assessed their impacts on croplands in Southeast Asia. Data on droughts and their impacts on croplands are important for policy makers and the scientific community. Here we developed a LEET web-based platform to provide data of the impacts of droughts on agriculture in the Southeast Asia during the crop growing seasons over a 40+ period. The data were generated using the TerraClimate global high-resolution gridded Palmer Drought Severity Index (PDSI) datasets in LEET could using Machine Learning algorithms along with Google Earth Engine. Rainfed crops in Thailand, Cambodia, and Myanmar were strongly affected by droughts, whereas Indonesia, the Philippines, and Malaysia were more affected by floods. Accordingly, four levels of policy interventions were prioritized by considering the geolocated crop damage levels. The near real-time drought and climate datasets were available to public at regional to national level for better policy interventions in the region.

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Xylem-specific RNA isolation from Fusarium oxysporum infected chickpea (Cicer arietinum) roots using LCM approach

Manoj Kumar[1,2], Pooja Yadav[1,2], Swati Singh[1,2] and **Kritika Sharma[1,2]**

[1]CSIR-National Botanical Research Institute, India

[2]Academy of Scientific & Innovative Research (AcSIR), India

Fusarium oxysporum f. sp. ciceris, the causal organism of chickpea vascular wilt disease reduces yield upto 90% annually. Xylem play prominent role in vascular wilt resistance in plants. Transcriptome profiling of root xylem from contrasting chickpea genotypes will be very useful to decipher genes involved in wilt resistance. RNA isolation from root xylem tissue is an arduous procedure that has not yet been standardized. In this study, we have described an efficient method to obtain RNA of high quality in a sufficient amount from LCM-derived chickpea root xylem tissue. For this, we have infected two contrasting chickpea genotypes WR315 (wilt resistant) and JG62 (wilt susceptible) with F. oxysporum f. sp. ciceris race 2 (Foc2) strain to understand molecular interactions. Control and Fusarium infected root tissue samples were collected post-inoculation of Foc2. Root tissue samples were processed by fixing, embedding, and cryosectioning. Root sections were collected on poly-L-lysine coated PEN membrane slides. These slides were processed for OCT removal and dehydration. Sections were dehydrated using ethanol and xylene and further utilized for microdissectioning under Laser Capture Microdissection (LCM) machine. Histological analysis using lactophenol cotton blue stain indicating the infestation of Foc2 in the vicinity of root xylem tissue. Dehydrated sections were imaged, marked around xylem cells, dissected using infrared rays, and finally catapulted in AdhesiveCaps through LCM (Figure 1). RNA was extracted from approx 7200 xylem cells of each sample and quantified using bio-analyzer that yielded intact RNA ranges from 92-114 ng µl-1 with RIN value up to 7 (Table 1). These RNA samples would be utilized for molecular studies i.e. transcriptome analysis to find out genes involved in Fusarium wilt resistance in chickpea. Our protocol was capable of extracting good quality RNA from Fusarium-infected chickpea root tissues, with good RIN value. This optimized LCM-based RNA extraction method from root xylem tissue is useful in the applications like gene expression studies in xylem cells during biotic and abiotic stresses.

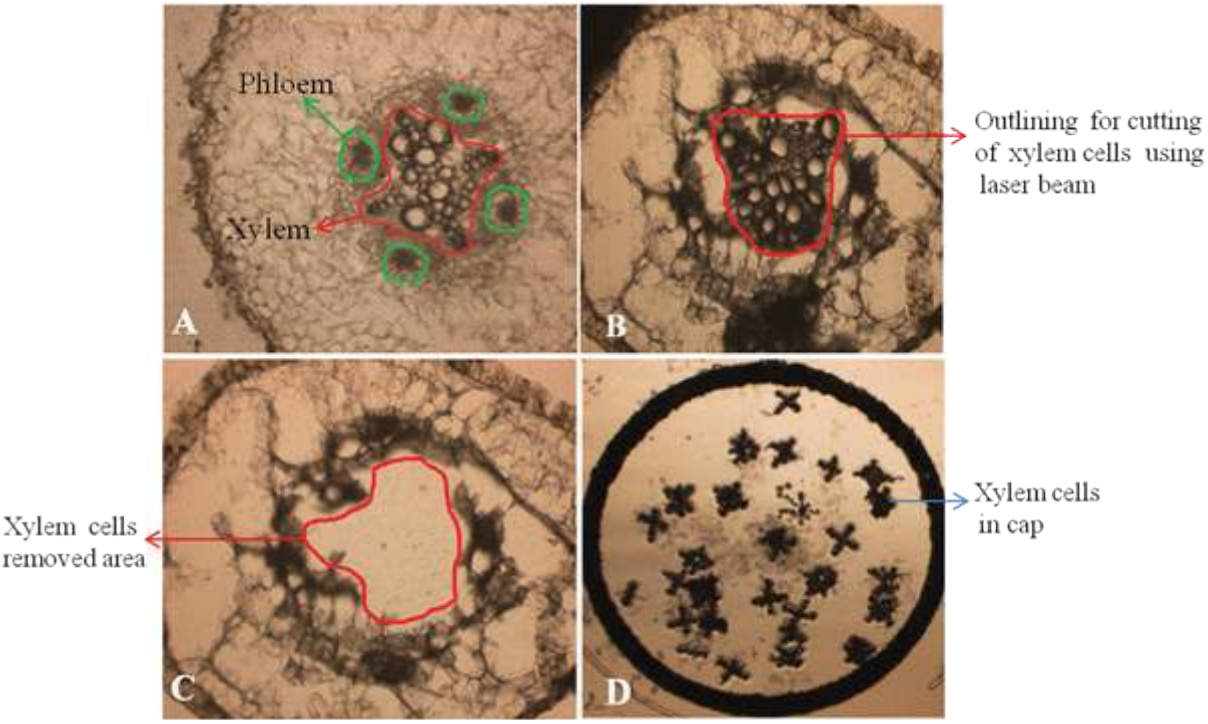

Figure 1: *Imaging and capturing of xylem tissue from chickpea roots. (A) Root section showing xylem and phloem tissues. (B) Outlining of xylem cells using a laser beam for cutting and capturing. (C) The section after catapulting xylem cells. (D) AdhesiveCap contains catapulted xylem cells.*

S.N.	Plant samples	RNA Conc. (ng ul-1)	RIN value	Types
1	JG62 (C)	39.69	3.3	Without fixation (type I)
2	JG62 (Foc2)	26.96	2.0	
3	WR315 (C)	37.55	2.1	
4	WR315 (Foc2)	33.95	2.0	
5	JG62 (C)	92.6	6.9	Fixation before embedding (type II)
6	JG62 (Foc2)	100	7.0	
7	WR315 (C)	95.94	7.0	
8	WR315 (Foc2)	114.34	7.0	

Table 1. *Effect on quality (RIN) and quantity (conc. in ng µl−1) of RNA extracted by two type methods.*

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Nonmedical determinants of congenital heart diseases in children from the perspective of Mothers: A qualitative study in Iran

Maryam Borjali
University of Medical Sciences, Iran

Mortality due to noncommunicable diseases has increased in the world today with the advent of demographic shifts, growing age, and lifestyle patterns in the world, which have been affected by economic and social crises. Congenital heart defects are one of the forms of diseases that have raised infant mortality worldwide. The objective of present study was to identify nonmedical determinants related to this abnormality from the mother's perspectives. Methods .This research was a qualitative study and the data collection method was a semistructured interview with mothers who had children with congenital heart diseases referring to the Shahid Rajaei Heart Hospital in Tehran, Iran. A thematic analysis approach was employed to analyze transcribed documents assisted by MAXQDA Plus version 12. Results. Four general themes and ten subthemes including social contexts (social harms, social interactions, and social necessities), psychological contexts (mood disorders and mental well-being), cultural contexts (unhealthy lifestyle, family culture, and poor parental health behaviors), and environmental contexts (living area and polluted air) were extracted from interviews with mothers of children with congenital heart diseases. Conclusions. Results suggest that factors such as childhood poverty, lack of parental awareness of congenital diseases, lack of proper nutrition and health facilities, education, and lack of medical supervision during pregnancy were most related with the birth of children with congenital heart disease from mothers' prospective. In this regard, targeted and intersectorial collaborations are proposed to address nonmedical determinants related to the incidence of congenitalheart diseases.

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Investigation of aerosol and ozone interaction over Zanjan, Iran: Ozone formation and radiative forcing implications

Maryam Gharibzadeh[1], Abbasali Aliakbari Bidokhti[1] and **Khan Alam[2]**

[1]*Institute of Geophysics, University of Tehran, Iran*

[2]*Department of Physics, University of Peshawar, Pakistan*

The variations in ozone concentration, aerosol properties and ozone-aerosol interactions can be investigated to better understand the atmospheric radiation budget and its effects on climate. The scattering and absorption of solar radiation due to the direct effect of aerosols can change solar radiation reaching the earth's surface. Consequently, aerosols change the photolysis rate and cause changes in ozone production. Moreover, aerosols affect the temperature structure of the atmosphere and thus modify ozone production. In this study, the effects of aerosol on ozone were analyzed over Zanjan, Iran during 2008-2018. The high values of Aerosol Optical Depth (AOD), Particulate Matter (PM10) and Absorption Aerosol Optical Depth (AAOD) were observed in the spring and summer, whereas low values in the fall and winter were determined. In the dusty days and months, there was a negative correlation between tropospheric and surface ozone and AOD, as aerosol has reduced the concentration of ozone. The small and negative values of Aerosol Index (AI) in the late spring, summer, and fall were due to the dominance of scattering aerosol like dust in the atmosphere of Zanjan. A comprehensive study of the effects of the types of aerosols on ozone showed that coarse mode aerosols such as dust reduced the ozone concentration. On the other hand, anthropogenic fine mode aerosols such as urban/industrial had a positive effect on ozone production. The relationship between AOD, Aerosols Radiative Forcing (ARF) and ozone, revealed that coarse mode aerosols such as dust with higher AOD, reduced the sunlight reaching the surface. As a result, ARF values were found to be more negative at the surface, thus the photolysis rate decreased considerably, and the concentration of surface ozone was reduced considerably.

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Assessment of groundwater mass balance and zone budget in the semi-arid region: A case study of Palar sub-basin, Tamil Nadu, India

Mathiazhagan Mookiah[1], Sanjeev Kumar Jha[2] and **Ashis Biswas[2]**

[1]Centre for Geotechnology, Manonmaniam Sundaranar University, India

[2]Department of Earth and Environmental Sciences, Indian Institute of Science Education and Research Bhopal, India

Assessment of groundwater potential zones is crucial for estimating and managing available groundwater resources. In the proposed study, quantification of groundwater availability is performed using the information collected from the hydrogeological and geophysical (electrical resistivity) investigation of the aquifer. We delineate groundwater potential zones by a weighted overlay analysis based on conventional method with 110 electrical resistivity surveys and 40 lithological data. MODFLOW is used to calibrate and validate the flow pattern and groundwater characteristics. The study area comprises of a complex geological formation. The groundwater potential map is prepared using the observed groundwater level instead of rainfall data as the study area lacks rainfall stations. The final potential map is validated with the specific capacity obtained from pumping test. This map is divided into 13 zones and each zone is considered as boundaries for the MODFLOW simulation. The thickness of each zone is assessed using electrical resistivity method. The calibration and validation of the groundwater model are performed for one year and 1.5 year respectively between November 2012 to March 2015. The groundwater volume during the calibration and validation period is found to be 7.12 Mm^3 and 7.51 Mm^3 respectively. The groundwater mass balance assessment performed in this study will be extremely useful in the planning and management of groundwater resources.

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Climate change, internet and the cotton yield gap between African countries and the rest of the world

Mathieu Juliot Mpabe Bodjongo
University of Dschang in Cameroon, Cameroon

This paper analyzes the effects of climate change and internet access on cotton yield gaps between African countries and other producing countries over the period 1995-2019. Drawing on the economic literature, econometric results, obtained using a Kr□ger & Hartmann (2021) decomposition model, reveal that African countries lag behind other producing countries in cotton yield. Increased temperature variation, improved levels of education, and internet access are likely to reduce this gap. On the other hand, rising temperatures do not help to reduce this gap.

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Recent variations average maximum and minimum air temperatures over Bangladesh

Md. Hasan Imam

Agro-Meteorological Information Systems Development Project (AMISDP), Department of Agricultural Extension, Bangladesh

In the present study, long-term monthly average maximum and mean minimum air temperatures were analyzed to evaluate recent variations in Bangladesh's climate. Seasonal and yearly values were calculated by averaging monthly data. According to the Bangladesh Meteorological Department, seasons have been categorized as follows, pre-monsoon: March–May; monsoon: June–September; post-monsoon: October–November; and winter: December–February.

The study has evaluated the annual, seasonal, and monthly maximum and minimum air temperature time series for 34 sites in Bangladesh from 1981 to 2020. Sen's slope estimator, linear regression, and Mann-Kendall were the three statistical tests that were utilized in the investigation. A considerably increasing maximum air temperature trend was observed at 47% of stations during the pre-monsoon, 100% during the monsoon, 74% during the post-monsoon, and 24% during the winter season. Similarly, during the pre-monsoon, monsoon, post-monsoon, and winter seasons, it was revealed that minimum air temperatures were noticeably rising in 41, 91, 41, and 35% of stations, respectively. According to the linear regression technique, the significant increasing maximum air temperature trends at the Patuakhali and Mongla stations are 0.83°C/decade and 0.82°C/decade in February and October, respectively. The stations of Mongla (-0.58oC/decade) and Sandwip (-0.63oC/decade), respectively, reported the highest time series value decreases for the monthly maximum and lowest air temperatures in January. This knowledge will be useful for generating adaption plans that will decrease the negative effects of climate change. Bangladesh must put into practice measures including vulnerability analyses, disaster management, enhanced structure design, institutional reform, and anti-extreme climate engineering in order to adapt to climate change.

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A study on the dynamical system of the effect of carbon dioxide gas in the atmosphere

M. Haider Ali Biswas[2] and **M. Nazmul Hasan**[1]
[1]*Government M M College, Bangladesh*
[2]*Khulna University, Bangladesh*

This paper formulates and analyzes a deterministic nonlinear model to explore the effects of human population and forest biomass on the dynamics of atmospheric carbon dioxide (CO2) gas. The model system tends to assume the concentration of CO2 in the atmosphere increases for the deterministic natural sources along with the anthropogenic factors. Further, the paper has the anticipation on that the density of atmospheric CO2 that forest biomass and other natural sinks absorb. However; the analysis is carried out in continuous time. Equilibria of the model has been obtained and their stability discussed. The model analysis reveals that human density declines with an increase in anthropogenic CO2 emissions into the atmosphere. Further, the findings posit that the depletion of forest biomass due to human activities, deforestation, leads to increase in the atmospheric concentration of CO2. Moreover; this research work purposefully determines bounds for the gas volume and discusses the complexity and stability of the equilibria. Eventually, it culminates to the evidence that the deforestation rate coefficient destabilizes effect on the dynamics of the system and the system loses its stability when the threshold value exceeds. Again; periodic solutions may arise through Hopf-bifurcation. The stability and direction of these bifurcating periodic solutions are analyzed by using center manifold theory. And the demonstration of the numerical simulations helps to support the analytical results.

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Recreational satisfaction and conservational nexus in Sundarbans mangrove forest in Bangladesh: Application of contingent valuation method

Md. Hafiz Iqbal
Government Edward College, Bangladesh

The degree to which present prosthetic recreational and conservational assessments of the Sundarbans illuminate sustainable forest strategy policy and speculation choices is muddled. To additional knowledge in this field, existing evidence gaps and method design should be recognized, therefore informing the plan regarding future research. This study examines the tourists' willingness to pay (WTP) because of policy changes based on group discussion and surveys. Following the random sampling technique, a well-designed dichotomous preference-based questions and contingent valuation method were employed to disclose stated preference (SP) data and estimating WTP for recreational satisfaction-induced conservation of Sundarbans. Tourists' age, monthly income, educational status, and trip expenditure are influential factors of WTP. Positive values of the lower and upper WTPs for the conservational scheme imply that investment in this scheme provides greater return from the collected revenue from the tourists and mobilize it for forest landscape restoration, nurture mangrove and other native tree species, control water pollution, and ecotourism. Probit logistic regression models disclosed tourists' recreational satisfaction through WTP and their preference-based conservation measures of Sundarbans. It also provides research avenues and offers a framework for valuing conservation practice in forest. Understanding the tourists' preferences provides information that could improve recreational satisfaction and other potential tourism policy implications to sustainable management practice for the conservation of Sundarbans.

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Green synthesis, characterizations and power monitoring of AgNPs using red spinach extract

K.A. Khan[1], Md. Abdul Wadud[2] and **Salman Rahman Rasel[3]**

[1]Department of Physics, Jagannath University, Bangladesh

[2]Department of Chemistry, Dhaka Cantonment, BAF Shaheen College, Bangladesh

[3]Local Government Engineering Department (LGED), Bangladesh

It has been synthesized AgNPs using red spinach extract. It is used AgNO3 as a precursor. It has been characterised using UV-Visible and FTIR techbiques. It is shown that the UV-visible spectra of Red spinach extract (blue line), AgNO3 salt solution in DI water (red line) and synthesized AgNPs (green line). Blue line and red line did not appear any particular peak from total 300 to 800 nanometer wavelengths. In the UV-visible spectrum reveals a sharp peak at around 340 nm which is appeared due to the band emission of silver nanoparticles. On the other hand, the green line showed a clear peak from the range of 400 to 500 nanometer wavelength, which in turn affirms the presence of Ag NPs. The maximum absorption is observed with a strong broad peak at around 430 nm due to the transformation of Ag0 from Ag+ which is corresponded to the surface plasmon absorption of AgNPs. Results represents the FTIR spectra of filtered Red spinach extract. The spectra revealed several peaks at around 1018.41 cm-1, 1093.64 cm-1, 1215.15 cm-1, 1263.37 cm-1, 1639.49 cm-1, 2115.91 cm-1, 3363.86 cm-1.The peak at around 1018.41 cm-1 may be associated for the stretching of strong C-F bond of fluoro compound whereas the peak at around 1093.64 cm-1 is appeared due to the stretching of C-O bond of aliphatic ether.The C-O stretching bond of alkyl aryl ether may be responsible for the peak at around 1215.15 cm-1 and 1263.37 cm-1 both. Furthermore, the peak at around 1639.49 cm-1 was appeared due to the stretching vibration of C=C.Another sharp peak at around 2115.91 cm-1 is originated due to the stretching vibrations of C C bond. Moreover, the peak at wave number 3363.86 cm-1 may be appeared due to the O-H and N-H stretching both. The synthesized AgNPs using red spinach have been used for power monitoring using electrochemical cells. A comparative study have been conducted like open circuit voltatge, shortcircuit current,maximum power, internal resistance, power density and the intensiity of light of the LED bulb both with and without AgNPs for an electrochemical cell using red spinach extract. It is shown that after using the AgNPs the open circuit voltage, short circuit current, maximum power,internal resistance, power density has been increased significantly and the internal resistance has been also decreased sinificantly. It is also found that the intensity of the LED bulb has also been increased reasonably after using the AgNPs. This research work may be the guide line for future work.

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Hemoglobin level and associated factors among pregnant women in rural Southwest Ethiopia

Melesse Niguse Kuma[1], Dessalegn Tamiru[1] and **Tefera Belachew[1,2]**

[1]Department of Nutrition and Dietetics, Jimma University, Ethiopia

[2]School of Graduate Studies, Jimma University, Ethiopia

Background: Anemia is a situation in which the number and size of red blood cells, or the concentration of hemoglobin, falls below established cut-off values. This study aimed to assess the hemoglobin level and associated factors among pregnant women in rural communities of Jimma zone, Southwest Ethiopia.

Methods: A community-based cross-sectional study design was carried out among 367 pregnant women from June 1-30, 2020. Systematic random sampling was used to select study subjects. An interviewer-administered structured questionnaire was used to collect the data. Descriptive statistics were used to describe the study subjects. A multivariable linear regression model was employed after the assumptions were checked. The Un-standardized beta (β) coefficient along with a 95% confidence interval was computed to estimate the association between explanatory and dependent variables. Statistical significance was declared at P-value < 0.05.

Results: The mean (± SD) hemoglobin level of the respondents was 12.66 (±1.44) g/dl. The overall magnitude of anemia (hemoglobin level < 11g/dl) among pregnant women was found to be 23.16%, [(95% CI: 18.3% - 27.5%)]. Meal frequency [β = 0.40, (95% CI: 0.12, 0.69), P = 0.005], inter-pregnancy interval [β = 0.08, (95% CI: 0.02, 0.15), P = 0.007], mid-upper arm circumference measurement [β = 0.13, (95% CI: 0.07, 0.20), P = < 0.001], Own fruits/ vegetable [β = 0.55, (95% CI: 0.79,0.31),P =< 0.001], coffee consumption [β = -1.00,(95% CI: -1.31, -0.68), P = < 0.001], and having history of still birth [β = - 0.63, (95% CI: -1.06, -0.20), P = 0.004] were significantly associated with the hemoglobin level of pregnant women.

Conclusions: Anemia was identified to be a moderate public health problem in the study area. Therefore, nutritional counseling should focus on the necessity of at least one extra meal, and promotion of fruits/vegetable consumption, of the women during antenatal care follow-up.

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Characterization of gaseous emissions from the combustion of some common charcoal in southwestern Nigeria

Oke M. A[1], Sonibare J. A[2], Onakphor.A[2], Oyewale B.O[2] and **Akeredolu F. A[2]**

[1]Chemical Engineering Department, Covenant University, Nigeria

[2]Chemical Engineering Department, Obafemi Awolowo University, Nigeria

In the developing countries of the world like Nigeria charcoal is a common source of fuel that is extensively used and this can leads to the emission of various pollutants which are harmful to human health. The aim of this study is to characterize the gaseous emission from the combustion of some common wood charcoal species in southwestern Nigeria and to determine the best wood for charcoal using E8500 portable industrial combustion analyzer. The scope of this work is limited to southwestern, Nigeria. The common charcoal samples from Southwestern Nigeria were collected from charcoal producers. Proper identification was done with the assistance of charcoal producers. The scientific names and the species names were sourced from the literature. Upon identification, charcoals were taken to the laboratory for preparation of the charcoal samples. The charcoals were subjected to open burning and the emissions for each were recorded. The criteria pollutants emissions from this study are CO, HC, NO, and NOx The results obtained showed that the emission factor were of the range 4.850 – 26.392 g/kg with an arithmetic mean of 17.092±7.483 g/kg for CO, 8.58×10−4 – 3.01×10−4 g/kg with an arithmetic mean of 4.85×10−4±1.631×10−4 g/kg for HC, 0 – 1.84×10−2 g/kg with an arithmetic mean of 3.28×10−3±5.948×10−3 g/kg for NO and 0 – 1.84×10−2 g/kg with an arithmetic mean of 3.28×10−3±5.948×10−3 g/kg for NOx. The maximum impact on CO was from Vitellaria paradoxum, the maximum impact on HC, NO and NOx was from Albizia zygia. The minimum impact on CO and HC was from Milletia thoninngii, the minimum impact on NO, NOx was from Funtumia elastic. Hence it shows that Milletia thonningii will be the best wood for Charcoal that will give the minimum impact on the health of the users.

Table 1. Emission factor of gaseous emission concentrations from Charcoal species.

S/N	Charcoal Samples	Emission Factor (g/kg)					
		CO	HC	NO	NO_x	SO_2	H_2S
1.	*Anogeissus leiocarpa*	21.725	0.000441	0.0	0.0	0.0	0.0
2.	*Vitellaria paradoxum*	26.392	0.000393	0.00390	0.00390	0.0	0.0
3.	*Burkea africana*	14.999	0.000532	0.0	0.0	0.0	0.0
4.	*Albizia zygia*	22.917	0.000858	0.01835	0.01835	0.0	0.0
5.	*Milicia excelsa*	6.262	0.0003014	0.0	0.0	0.0	0.0
6.	*Terminalia avicenn.*	19.635	0.0005026	0.00451	0.00451	0.0	0.0
7.	*Funtumia elastica*	15.059	0.0005410	0.00359	0.00359	0.0	0.0
8.	*Milletia thonningii*	4.850	0.0003312	0.0	0.0	0.0	0.0
9.	*Hevea brasilensis*	21.988	0.0004630	0.0	0.0	0.0	0.0

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Investigating the performance of hydroponic nutrient solutions as potential draw solutions for fertilizer drawn forward osmosis

Mohamed Bassiouny[1], Peter Nasr[2] and **Hani Sewilam[3,4]**

[1]Center for Applied Research on the Environment and Sustainability (CARES), School of Science and Engineering, The American University in Cairo, Egypt

[2]Center for Applied Research on the Environment and Sustainability (CARES), School of Science and Engineering, The American University in Cairo, Egypt

[3]Professor and Director, Center for Applied Research on the Environment and Sustainability (CARES), School of Science and Engineering, The American University in Cairo, Egypt

[4]Managing Director, UNESCO Chair in Hydrological Changes and Water Resources Management, RWTH Aachen University, Germany

This research project aims at investigating the performance of hydroponic nutrient solutions as draw solutions for desalination using the fertilizer drawn forward osmosis (FDFO) process. Six different lettuce and leafy greens hydroponic nutrient stock solutions were prepared according to the literature and used in this study and tested on a bench-scale forward osmosis unit as draw solutions for the process. The feed solution for the process was De-Ionized water mixed with NaCl in different concentrations, to represent different salinities of brackish groundwater. The draw efficiency of each solution was measured based on water flux, specific reverse solute flux, water recovery, and salt rejection. It was concluded that of the six tested nutrient solutions, the "Resh Florida, California" solution is the recommended solution to be used as draw solution for fertilizer drawn forward osmosis, due to its high performance in terms of water recovery (15.75%), flux (11 l/m2/h), salt rejection (92%) and SRSF (highest recorded SRSF for a specific ion (SO42-) was 7.3 g/l), as well as its low cost, relative to the other highly performing draw solution "Chekli" ($1.07/l vs. $3.73/l).

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Simulation of land use change, rainfall and temperature in Mashhad metropolitan area during 1984-2030 period, using neural network model

Mohammad Rahim Rahnama

Professor of Urban Planning and Geography, Department of Geography, Ferdowsi University of Mashhad, Iran

The aim of this study is to simulate land use changes, climate changes (temperature and rainfall) and population changes in Mashhad metropolitan area with an area of 181418.8 hectares in northeastern Iran, between 1984 and 2030. To achieve this goal, first by using Landsat 5, 7 and 8 satellite images in TeerSet and ArcGIS software. Land use changes were classified using the maximum likelihood estimation technique in five groups in 1984, 2000 and 2020. Then, the prediction of land use change for the periods of 2020-2030 was simulated using neural network and Markov chain. The results of land use change between 1984 and 2020 showed that barren lands increased by 15,993.7 (73.92%) hectares and built-up lands by 12,823.79 (59.27%) hectares, respectively. Green space lands have decreased by 15,811.71 (-73.08%) hectares. In the same period, the average temperature has increased by 2.6 degrees Celsius and the annual rainfall has decreased by 24 mm. The population of this metropolitan area has increased from 1,632,213 people to 3,345,409 people (growth of 2.04%) from 1986 to 2016, both urban (three cities of Mashhad, Targahba and Shandiz) and rural settlements (177 villages). The prediction of land use change for the periods of 2020-2030 using Marco chain model and neural network showed that the built-up land will increase by 13153.3 hectares (38.17%) and vacant land by 7503.91 hectares (11.34%). In the same period, green space will decrease by 12399.5 hectares (-26.21%) and mountain lands by 8389.13 hectares (-25.64%). Time-spatial distribution of land use from mountainous to built-up mainly in the southern slopes of the city and vegetation to the built-up mostly occurred in the north, northeast and northwest. The relationship between temperature and vegetation is negative (R=-0.11). But the relationship between temperature and built-up is positive (R=0.27). In general, the increase in the degree of drought and the decrease in rainfall have led to the barrenness of agricultural lands, providing the ground for the conversion of barren lands into built-up ones, especially as a result of population growth. The mutual influence of the above three factors is a serious threat to sustainable development in cities in arid and semi-arid regions. And it requires the development of environmental protection planning in line with the goals of sustainable development.

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Performance of high-density polyethylene-starch-linen fiber biocomposite

M. ZIGHED and **B. Benotmane**
Faculty of Technology, Research Unit of Materials, Process and Environment (URMPE), Algeria

The new sustainable development approach and environmental constrains push the current researches to be in coherence with the requirements of such route of development, reducing or substituting synthetic plastics (conventional polymers) are ones of these main concerns; in this regard we proceeded to the elaboration of high density polyethylene based bio composites consisting of HDPE/starch reinforced with linen fiber.

Starch and natural fiber are renewable, low cost and biodegradable materials permitting the increase of composite biodegradation rate and contributing in the reduction of plastic waste which is considered as an environmental dilemma facing the world. The linen fibers were modified through alkali treatment to enhances the adherence aspect and the strength of these fibers

A large series of PE/starch/fiber blends at different contents were manufactured through thermocompression process, however the whole process is constituted of two step, mixing and thermos compression. Mechanical, thermal, structural and morphological proprieties were investigated in the aim of optimizing and studying the effects of linen fiber and starch addition to HDPE.

The tests s has shown a promising results, mechanical Izod impact and tensile strength tests has showed an enhanced stiffness and Young's modulus, whereas the Izod impact and tensile tests has decreased following fiber and linen incorporation. The weak compatibility in the matrix was revealed by SEM analysis and emphasized by FTIR spectra. Furthermore, and according to DSC and ATG analysis, the crystallinity was improved, however the thermal stability was slightly affected. The performance of The biocomposite with 60% HDPE, 20% starch, and 20% linen fiber has permitted to consider the previous formulation as highly acceptable for adoption in packaging application seen that even the decrease in some characteristics remain hugely moderate.

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Space and sense of place in literary imaginations: An enquiry of Manto's Short Story "Toba-Tek Singh" through political geography perspective

Mohd Firoz Ahamed
Aligarh Muslim University, India

Present paper aims to investigate the production of "space" and "sense of place" in literary imaginations. Theoretically it analyses the "imagined spaces" of literature. This research tends to examine that; how spatial elements centrally influences the literary imaginations specially through geographical attributes. The theoretical argument of this paper is developed through political geography and humanistic geography perspectives. As a case study, the literary art in form of fiction was taken. This paper examines the short story "Toba Tek Singh" on spatial scale. It discusses the role of place as a geopolitical tool produces the literary imagination. The story is written by Saadat Hasan Manto just after the partition of India in 1955 that focusses upon the inmates of mental asylum of Lahore. It also analyses the geopolitical concepts that have been involved in the form of boundary and "No Mens Land" as metaphors influencing the "imagined space" in this piece of writing. The hypothesis of this research is based upon the literature as cultural and imagined product of human civilization is rooted in the "spatial consciousness". This work is purely based upon qualitative methods. The narratives, discourses and arguments on place and space consciousness influencing the literature has been analysed for the purpose. The conclusive domain of this work covers as imagined literary entity and its narration of historical, social, cultural, political and economic realities of human society is shaped by geo- spatial structure. Further, this work has observed the central role of "sense of place" and feelings of "place lessness" attached with the cognitive space of main character of the story that is reflected in his behaviour. Hence analysis represents that literary production is located in the social spaces at a definite time and that attempts to generate "Imagined space" through its creativity.

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Ghost stochastic resonance in an asymmetric Duffing oscillator

A.F.Moyo Tala, Y.J.Wadop Ngouongo, G.Djuidjé Kenmoé and **T.C.Kofané**
Department of Physics, Faculty of Science, University of Yaoundé I, Cameroon

Nonlinear systems excited by noise and periodic forces composed of several frequencies exhibit the phenomenon of ghost stochastic resonance, which is found in several scientific fields ranging from biology to geophysics. The common novelty is the emergence at the output of the system of a frequency called "ghost frequency" that is absent at the input. The discovery of the existence of this phenomenon has led to the understanding of a whole range of problems, from the perception of the pitch of complex sounds or visual stimuli, to the explanation of climate cycles. In this study, we report the occurrence of the ghost stochastic resonance (GSR) for a Brownian particle in three types of asymmetry potentials. The dynamics of the particle is described by a Duffing oscillator. The asymmetries are controlled by the asymmetry parameter and introduced into the potential by varying the left well. These variations are: depth only, width only and both depth and width. The properties of the GSR in asymmetric systems are different from those of the symmetric system. It is shown that the observed resonance at the ghost frequency is due to the existence of this frequency during the dynamics of the particle. We also examine numerically the effect of the asymmetry parameter on the GSR phenomenon. It is found that the asymmetry parameter has a significant influence on the GSR and allows a precise control of the GSR occurrence.

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Promotion of climate-resilient mariculture technologies for enhancing aquatic food production, income, nutrition and women-led business in Bangladesh

M.A. Rahman and **M.A. Wahab**
WorldFish Bangladesh, Bangladesh

The ocean is the last employment resort, particularly for coastal people. Increased human domination on earth and climatic changes are greatly threatening coastal livelihoods. Therefore, the introduction and improvement of aquatic food production through sustainable harvesting and farming at the edge of the sea for coastal livelihood resilience is important. In Bangladesh, seaweeds (sea vegetables) and green mussel farming have great potential to boost the country's blue economy, although their culture has been poorly promoted. Marine pelagic small fish is long been considered as trash fish; therefore, they are either discard or sell at a very low price. USAID-funded project ECOFISH II in Bangladesh provided training to the coastal fishing communities and distributed supports for seaweed farming, green mussel farming, and the production of safe dry fish from marine pelagic small fish. In 2020 and 2021, 400 fishing households (HHs) and 200 HHs were involved with seaweed farming and green mussel farming, respectively. Besides, 1000 fishers' women were involved with safe dry fish production from marine pelagic small fish during that couple of years. Promotion of these technologies boosted the country's seaweed, green mussel and safe dry fish production at a significant level. Besides, the income of the fishing households increased 15-20% more. Women income increased in the family and eventually improved their well-being status and food security. Fishers' women produced diversified processed foods from safe dry fish and seaweeds for market niche thus women-led business was established. Through the intervention of the project, non-conventional nutritious aquatic food items become popular seafood items among the local consumers, and "trash fish" turns into "cash fish". In conclusion, aquatic food production should increase to enhance the resilience of coastal fishers' livelihoods.

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Effects of yeast extract on the production of phenylpropanoid metabolites in callus culture of purple basil (Ocimum Basilicum L. var purpurascens) and their in vitro evaluation for antioxidant potential

Muhammad Naeem Bajwa and **Gouhar Zaman**
Department of Biotechnology, Quaid-I-Azam University, Pakistan

Plants have been used as the main source of phytochemicals with nutritional, medicinal, and cosmetic applications since times immemorial. Nowadays, achieving sustainable development, global climate change, restricted access to fresh water, limited food supply and growing energy demands are among the critical global challenges faced by humanity. Plant cell culture technology has the potential to address some of these challenges by providing effective tools for sustainable supply of phyto-ingredients with reduced energy, carbon and water footprints. Ocimum basilicum L. var. purpurascens is an enriched reservoir of pharmaceutically important compounds with plenty of health and therapeutic attributes such as phenolic acids and anthocyanins. However, the inefcient production of aforementioned metabolites in wild has restricted its commercial utilization. Herein, commercially viable phytochemicals have been enhanced through elicitation of in-vitro cultures of O. basilicum using yeast extract. The impact of various concentrations (YE 1 mg/L,YE 10 mg/L, YE 25 mg/L, YE 50 mg/L, YE 100 mg/L, YE 200 mg/L and YE 400 mg/L) of yeast extract on biomass accumulation, phytochemical production, and antioxidant activities were assessed in callus cultures. Moderate concentration of yeast extract (100 mg/L) enhanced biomass accumulation i.e. fresh weight (FW 216.28 g/L) and dry weight (DW 15.49 g/L) up to 1.5 folds as compared to control (FW 167.14 g/L and DW 10.25 g/L). Similarly, yeast extract (100 mg/L) increased total phenolic and favonoid contents as well as enhanced antioxidant activities such as ABTS (2,2 azinobis 3-ethylbenzthiazoline-6-sulphonic acid), FRAP (ferric reducing antioxidant power) and DPPH (2,2-diphenyl-1-picryhydrazyl). High performance liquid chromatography (HPLC) analysis was elucidated for further phytochemical

investigation. HPLC analysis showed an increase of almost 1.9 folds as compared to control in rosmarinic acid (15.19 mg/g DW), chicoric acid (2.13 mg/g DW), peonidin (2.70 mg/g DW) and cyanidin (1.57 mg/g DW). Likewise, 1.8-fold and 2.4 folds increase was observed in eugenol essential oils (0.25 mg/g DW) and chavicol (0.037 mg/g DW), respectively. For cellular antioxidant activity, reactive oxygen specie or reactive nitogen specie (ROS/RNS) was induced in yeast cells and the efect of O. basilicum callus culture was further investigated in stressed yeast cells. A positive correlation exists between the antioxidant activities, TPC and TFC analysis. In short, these results showed that yeast extract could act as an efcient elicitor to enhance pharmacologically important metabolites in callus cultures of Ocimum basilicum.

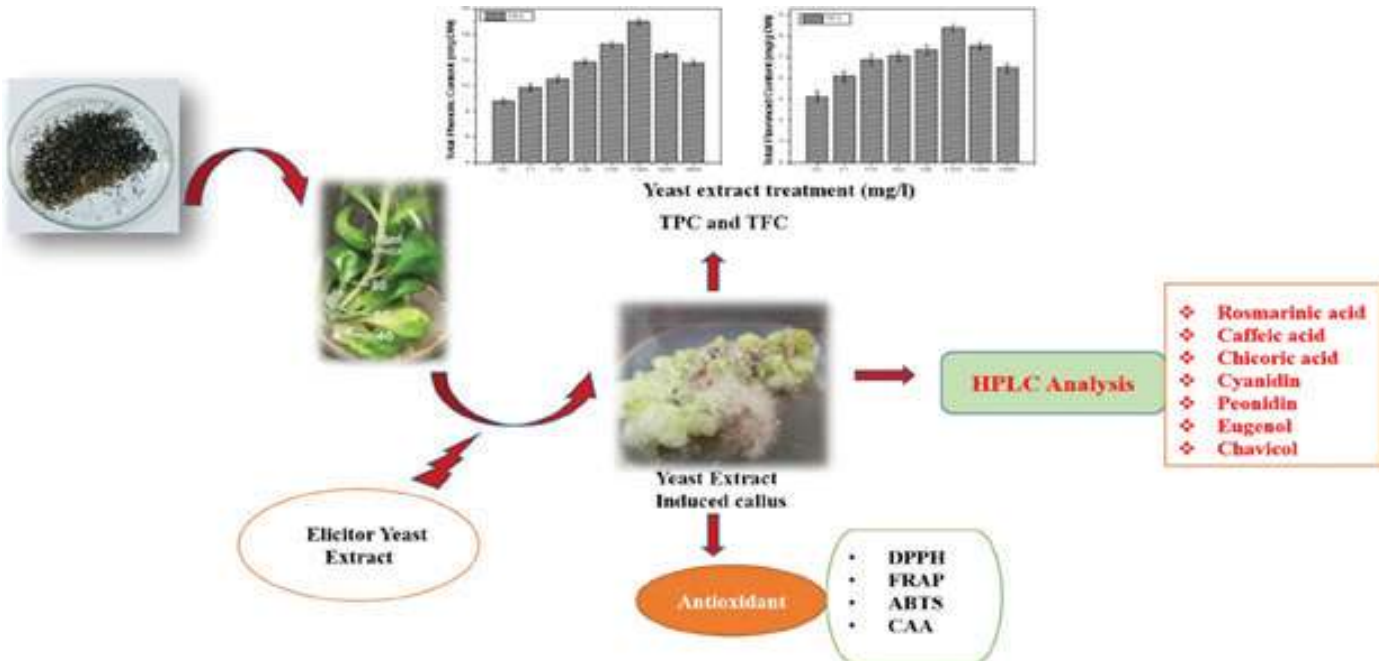

Figure: *Effects of yeast extract on the production of phenylpropanoid metabolites in callus culture of purple basil (Ocimum Basilicum L. var purpurascens).*

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Application of spatial information and digital infrastructure in participatory planning and e-governance at Panchayat Level: An Indian experiance

Nagaraja Ravoori
International Institute of Information Technology (IITH), India

The 73rd amendment to the Indian constitution provided constitutional status to the Panchayats, a third tier of governance operational as units of local self-governance. Around 70 % of the total households of the country are under the ambit of Panchayati Raj System which through its three tier system serves as a platform for planning and implementing programmes for economic development and social justice in a decentralized manner. A Gram Panchayat being the basic unit of administration in the Panchayati Raj is vested with powers to carry out formulation of plans and their execution to address the local needs and ensuring socioeconomic development of its area. The conventional method of drafting plans on paper using a sketch or text is still prevalent in many panchayats across the country. Such plans without exact knowledge of the surroundings may not be accurate in dimensions or sometimes in position as well. It is also seen that a significant time gap exists between submission of plans, further actions and corresponding approvals in the process of planning. To deal with such problems there is a requirement of spatial information that bridges the information gap and a platform that captures the whole process of planning in an accountable and participatory way.

Space based Information Support for Decentralized Planning (SIS-DP) is a project of ISRO suggested by Planning Commission (now NITI Ayog), which aims at digital empowerment of PRIs and citizens for developmental planning. It targets decentralization by including PRIs at all three levels in plan formulation and management. Conceptually the project focuses on:

a. Preparation of spatial database that includes High Resolution Satellite Image (HRSI) , thematic data at 1:10000 scale for the entire country and other datasets from various line departments.

b. Dissemination of prepared database to

PRIs through web enabled environment. To fulfil this, development of a web portal known as Bhuvan Panchayat has been developed through which PRIs can access all spatial and non-spatial data and can prepare spatial plans for their own panchayats.

Bhuvan Panchayat Portal, a web based single window for spatial and non-spatial data, offers enabling environment for Panchayat level planning & governance and aims at digital empowerment of society. The default window of the Portal is a map viewer that enables geo-visualization of satellite imagery for the entire country and can represent spatial details at Panchayat/village level. Moreover, various thematic maps (land use / land cover, drainage & water bodies, settlements, infrastructure - rail, roads, canal) generated at 1:10,000 scale along with administrative boundaries and slope layer can be overlaid on the satellite image. Various tools for navigation, measurement and visualization are provided to facilitate spatial analysis.

The activity planning module in Bhuvan Panchayat Portal offers preparation of plans under 17 flagship programmes of Govt. of India along with other schemes of national/ state importance. A citizen can make use of spatial data layers and can propose plans under various schemes on the portal. These plans can be viewed, modified and consolidated at all three tiers of PRIs through the portal itself. The portal thus brings the whole process of planning online and helps information to flow unanimously to each participating unit.

The present paper attempts the use of spatial data for planning towards digital empowerment of Panchayati Raj Institutions (PRIs) at grass-root level. This is aligned with Govt. of India's vision of e-governance and Digital India.

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The trend of changes in the coastline of southwestern Iran in the Persian Gulf due to drought over a period of 25 years

Naser Ebadati
Department of Geology, Islamic Azad University, Iran

In the coastal geographical area of southwestern Iran in the Persian Gulf, on the border between land and water, there are two ecosystems adjacent to different marine and continental climates, and drought, industrial development and geological phenomena are the most common features of this region. The processes governing coastal areas and its changes are a function of short-term and long-term trends and have variable amplitude and dimensions in different parts. The purpose of this study is to investigate the factors affecting the occurrence of coastal changes over a period of 25 years in the region. For this purpose, Landsat images from 1995 to 2019 were used to detect changes in the coastline of the study area. Monitoring of coastline changes in satellite images as well as after statistical analysis showed that there were significant changes in the water area of the coastline and in addition to changes in various man-made uses, the consequences of drought and low rainfall The shoreline has undergone significant spatial changes in some places up to more than 200 meters and changes in tidal range over a period of 25 years. And most of the changes have been in the form of vegetation conversion to desert or construction and water areas to barren lands and the most important marine habitats that are in coastal waters and islands of the study area, including mangrove forests and coral reefs are important. Trends, warming, drought and marine pollution are among the most important factors in the destruction of these marine ecosystems and endanger the stability of the aquatic ecosystem.

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A stochastic Markov chain model for solar generators in Algeria

N. Abdelhafidi[1] and **N. Bachari**[2]

[1]*Department of Electronics, University Amar Telidji of Laghouat (UATL), Algeria*

[2]*Laboratory of Oceanography Biologic and Marin Environment (LOBME), Department of Ecology and Environment, University of Sciences and Technology Houari Boumediene (USTHB), Algeria*

Due to the data quality, missing data issues, and time limitations when modeling solar radiation, the design of reliable modeling methods is needed. This study presents a Markov chain model to determine or forecast future solar radiation. In other words, the goal of this model is to build a simple forecasting tool in terms of statistical thresholds for stochastic solar generators. Moreover, the accuracy of our method is evaluated with data from 1990 to 2018 that has been recorded by three Algerian meteorological stations: Tamanrasset, Ghardaïa, and Oran, which represent respectively coastal, central and oasis sites. The results showed a good performance of this study's proposed method by using specific thresholds obtained by box-plots of historical data. Additionally, this method allows for the long-term conservation of the experimental data's statistical properties compared to the existing methods. Hence, we believe our proposal can help develop a new approach for optimizing energy production from solar energy sources and photovoltaic systems.

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An empirical analysis of supply chain competitiveness and cleaner production

Noman Arshed[1], Kamran Hameed[2] and **Asma Saher[2]**
[1]*University of Education, Pakistan*
[2]*University of Management and Technology, Pakistan*

The increasing world population has placed tremendous pressure on global production systems, which has created a disjoint between the production and sustainability related goals of this sector. Several studies have confirmed this notion via Environmental Kuznets Curve, but this study envisages proposing a possible solution. It is hypothesized that competitive supply chain ecosystems (cluster development & production process sophistication) could help in reducing growth based CO2 emissions globally. An assessment of 135 countries between 2008 and 2018 is conducted. The estimates showed that the supply chain competitiveness has the potential in greenification of our production systems. Here indicators like value chain breadth and cluster development can reduce the CO2 emissions at each production level. Further regions from the geographic map, like North America and Asia Pacific, can adopt a green supply chain from other regions.

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Effects of full and partial halo geomagnetic storms on an East African low latitude station

D. C. Obiegbuna[1], F.N.Okeke[2], K.C.Okpala[2] and **O.P.Orji[2]**

[1]*Department of Science Laboratory Technology, University of Nigeria, Nigeria*

[2]*Department of Physics and Astronomy, University of Nigeria, Nigeria*

Using the RINEX formatted TEC data from the global positioning system (GPS), we analyzed the impact of full and partial halo CMEs induced geomagnetic storms on ADIS (9.02 oN, 38.44 oE), an east African low latitude ionospheric station located in Addis Ababa, Ethiopia. The storms of 23rd June 2015 and 1st January 2016 which occurred in the solstice months of summer and winter respectively were quantified using Dst indices obtained from WDC Kyoto, Japan. The result showed contrasting storm time ionospheric responses to the two storm events which depended mainly on the timing of the storms occurrences, the onset of storm sudden commencement, and proton density (PD) peaks. Furthermore, the magnitudes of the PD determine the level of energy input during magnetic reconnections and subsequent formations of sub-storms and storms. This study points to the fact that the behavior of the African equatorial/low latitude is very much dependent on the timing of the geomagnetic storms. While seasonal effects are seen in the overall ionospheric responses at all the stages of the storm events, the storm-time responses depended on the time of the day the storm occurred and the orientation of the accompanying magnetic and electric fields. The result of this study complements a global effort towards understanding the complexities of ionospheric variability within the African low and equatorial ionosphere, especially at disturbed times.

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Public financing in agricultural research development and rural poverty alleviation: Evidence from West African Economic and Monetary Union States

Ollo Dah[1] and **Toussaint Boubié Bassolet**[2]
[1]*Université Norbert Zongo, Burkina Faso*
[2]*Université Thomas Sankara, Burkina Faso*

The paper examines the effects of public financing for agricultural research and development on rural poverty based on the variable farm income in the West African Economic and Monetary Union (WAEMU) States. To conduct this analysis, a dynamic panel comprising seven (07) WAEMU States has been built based on secondary data from World Bank, African Development Bank (AfDB) and Food and Agriculture Organization (FAO) databases for the period 2000 to 2016. To correct the endogeneity generated by the dynamic panel, the estimation is made by the system Generalized Moment Method (GMM). The results show that public spending on agricultural research and development contributes to reducing rural poverty through the increase of farm income. Thus, it is recommended that the WAEMU States make efforts in the allocation of public resources in the field of agricultural research and development to boost the development of the agricultural sector and significantly reduce rural poverty.

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Phytopathogenicity and control of Emmia lacerata FMIB29 on tomato (*Solanum lycopersicum* L.) plant

Oluwafemi Michael Adedire[1], Deborah Ebunoluwa Adedire[2], Wuraola Funmi Ogundipe[1] and **Adekunle Opeyemi Farinu[1]**

[1]*Department of Agriculture, Federal College of Agriculture, Nigeria*

[2]*Department of Genetics, Genomics and Bioinformatics, National Biotechnology Development Agency, Nigeria*

Tomato (Solanum lycopersicum L.) production is constantly threatened by wide array of mycopathogens. Emmia lacerata has been investigated as an endophyte, a saprophyte, a respiratory pathogen, and presently, as a soil-borne mycopathogen of tomato. The disease caused by E. lacerata FMIB29 in tomato was characterised through phenotypic assessment and controlled with antifungal plant extracts, using soil amendment assay (0.2 g/plant). Pathogenesis of E. lacerata on tomato ranged from mild chlorosis to severe stunt, or plant death. The highest leaf number, plant height, and disease severity reduction of 17.33 cm, 39.00 and 43.80%, respectively were recorded on G. arborea treated plants. Aqueous extracts of these inhibitory plants are accessible, and could be further studied for their biocontrol potentials against mycopathogens like E. lacerata. This will encourage tomato production and prevent pathogen transfer to humans; essentially, to avoid complications in individuals suffering from COVID-19 and other respiratory diseases.

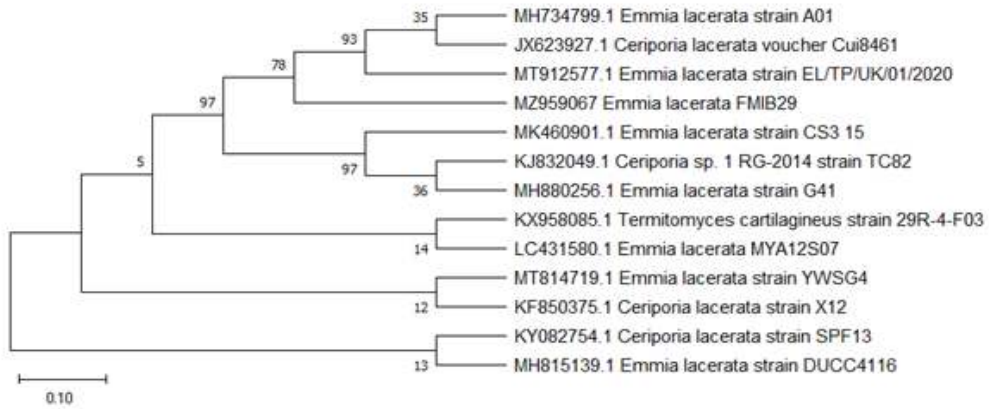

Figure 1: *Neighbor-joining phylogenetic relationship of Emmia lacerata FMIB29 with closely related isolates using partial ITS sequences (NCBI GenBank)*

Table 1: *Effect of soil treatment with antifungal wood extracts on Emmia lacerata disease of tomato six weeks after sowing*

Treatment	Plant height (cm)	Stem girth (mm)	Leaf number	Average severity score	Disease severity index (%)
Milicia excelsa	12.67±0.24d	2.50±0.20c	24.33±0.47d	2.50±0.29b	50.00±1.15b
Gmelina arborea	17.33±0.24b	4.83±0.12b	39.00±0.71b	1.33±0.17c	26.23±0.23d
Cola nitida	15.17±0.31c	2.83±0.12c	26.33±1.93d	1.67±0.16c	33.20±0.10c
Mancozeb (chemical)	18.67±0.24b	5.03±0.02b	35.00±0.41c	1.17±0.17c	23.21±0.11d
E. lacerata alone	10.00±1.08e	2.03±0.02d	18.67±0.24e	3.50±0.29a	70.03±2.89a
Control (uninfected)	22.33±0.85a	5.83±0.12a	42.67±1.25a	0.00±0.00d	0.00±0.00e

Mean values (± standard error).

Means followed by the same letter(s) within a column are not significantly different at 5% probability level according to Duncan's Multiple Range Test (DMRT).

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Ecological studies on the introduction of an alien species (Clerodendrum paniculatum Linn) in the Forest Plantation and Nature Reserve Forest of Tropical Africa, Nigeria

Omomoh BE[1,4], Brown L[2], Meijer K[3], Adekunle VAJ[1] and **Oboh G[4]**

[1]FUTA Herbarium, Centre for Research and Development, Federal University of Technology, Nigeria

[2]Faculty of Information and Media Studies, Western University, London, ON, Canada

[3]Herbarium Frisicum, Netherlands

[4]Department of Forestry and Wood, Federal University of Technology, Nigeria

Introduction: Clerodendrum paniculatum Linn is a known alien species discovered in the Akure forest where it is seen co-habiting with native plants mostly at the road edge of the study area. Its introduction to the ecosystem is unknown but its occurrence in the Strict Nature Reserve indicates early stages of invasion which call for proactive management control. The assessment of C. paniculatum is aimed at reporting its ecological characteristics and current impact on the protected area in Nigeria.

Materials and Methods:

Sampling design

In March 2020, we collected samples of C. Paniculatum at two different sites; Forest Plantation and Strict Nature Reserve. Four temporary sample plots of 400m2 (two at each site) were randomly demarcated along the vegetation road edge where C. Paniculatum was found. The first 10m line of 400m2 (20m by 20m) was stationed to start from the first occurrence of C. paniculatum, where it was sighted at the spatial area from the road edge to the smaller spatial area of the site (adjacent to the road edge). The scientific name and family followed the Flora of China Editorial Committee (2020).

Data analyses: The plant species were categorized using Hutchinson et al. (1963). The species relative density (Kent and Coker 1992) was calculated using Relative Density, Shannon-Wiener diversity, and Species Richness (Margalef) indices.

Conclusion: *C. paniculatum* is relatively dominant in the Forest Plantation which could

be due to its tolerance to light and its spatial distribution. The present result shows that C. paniculatum invasion is still at the early stage but these results further show species abundance has an ecological impact on the study areas. Efforts to eradicate it in the protected areas is dependent on forest management by the way of mechanical uprooting and immediate road edge rehabilitation with native species.

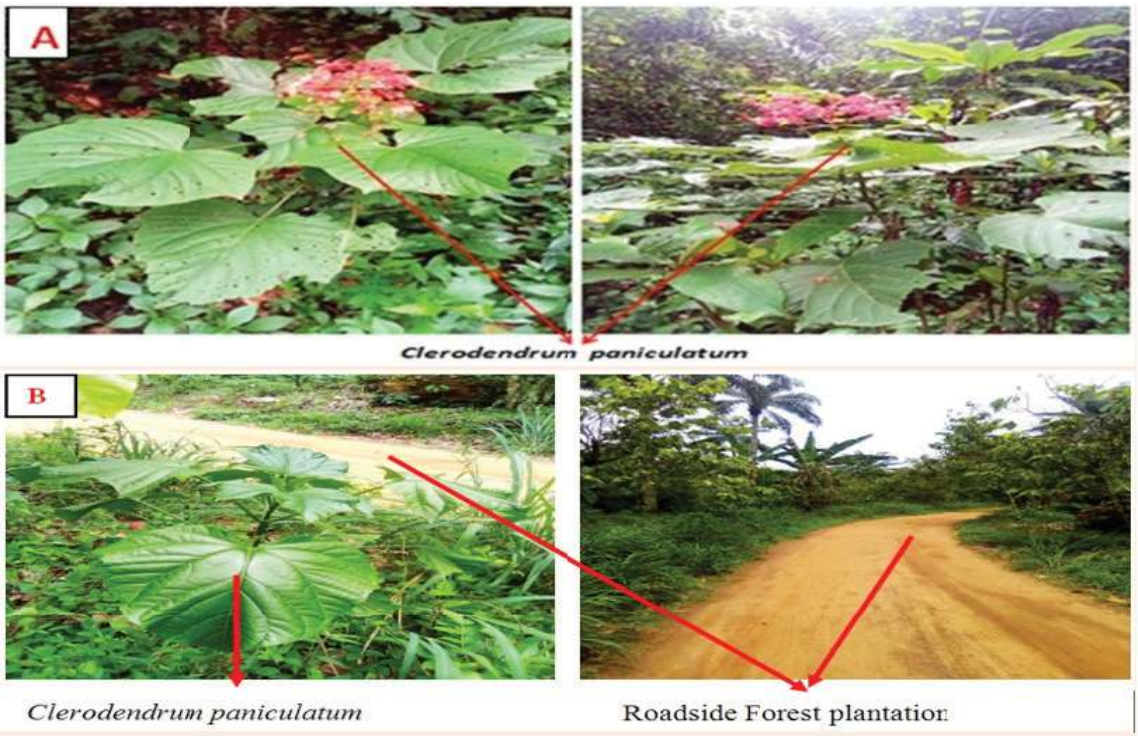

Figure: (a). *Clerodendrum paniculatum at the forest verge on the Strict Nature Reserve* ***(b).*** *The Forest Plantation roadside site where Clerodendrum paniculatum were found.*

Table 1 *Floristic analyses of community characteristics of invaded study areas*

	Forest Plantation	Strict Nature Reserve
Taxa	31	22
Individuals	432	396
Dominanace_D	0.075	0.12
Simpson_1_D	0.93	0.88
Evenness_e^H/S	0.59	0.52
Margalef	4.94	3.51

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Morphological and marker assisted selection for heat tolerance in tropical rice (Oryza sativa L.)

P. Sindhumole[1,2], V. Silpa[1], Jiji Joseph[1], Deepu Mathew[3] and **Rose Mary Francies[4]**

[1]Department of Plant Breeding & Genetics, College of Agriculture, Vellanikkara, Kerala Agricultural University (KAU), India

[2]AICRP on Medicinal & Aromatic Plants and Betel vine, KAU, India

[3]Department of Plant Biotechnology, CPBMB, College of Agriculture, KAU, India

[4]Agricultural Research Station, KAU, India

Rice is highly susceptible to heat stress, particularly during the reproductive and ripening stages. Most of the prevalent high yielding red grained rice varieties in Kerala (South India), are highly susceptible to heat stress. Hence it is the need of the hour to impart heat tolerance to such varieties to reduce the yield loss thereby enhancing the production to a great extent. To address this, Uma (a highly popular red grained rice variety of Kerala) was crossed with Nagina22 (N22), the donor rice variety for heat tolerance. In MAS, a marker tightly linked to the desirable gene would help in selecting that specific gene with high precision and hence more reliable than selection based on only morphological traits. This paper discusses about the morphological and marker assisted selection with linked SSR markers for heat tolerance in the early segregating generations of this tropical rice hybrid.

Impact of cloud computing on the Global climate

F. Dr. Parag Ravikant Kaveri
Symbiosis Institute of Computer Studies and Research, India

Cloud Computing is one of the trendiest and popular technology that is change the way of utilizing resources, although its effective service oriented pay as you go model it has a very high impact on Climate and global environment. Cloud resource allocation, a real-time problem can be dealt with efficaciously to reduce execution cost and improve resource utilization. Resource usability can fulfill customers' expectations if the allocation has performed according to demand constraint. Task Scheduling is NP-hard problem where unsuitable matching leads to performance degradation and violation of service level agreement (SLA). The study will help to understand the utilization of cloud and its resources by which the environment can be better safe guarded. The utilization of water, air and other natural resources for cooling the data center can leads to various climatic issues. The research address those issues and provide a broad scope of projection to solve the climate problem, by maintain a proper blend of technology need and environmental need one can resolve the issues of climate change and un predictable climate which is now a common problem for most of the counties. The research will address various alternatives and solutions for a better world with both technology and environment.

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Decarbonization of the maritme sector and sustainable development goal 13: The post-covid-19 era scenario

Paul Chukwudi Ezinna and **Uzochukwu Innocent Ozumba**
Institute of Maritime Studies, University of Nigeria, Nigeria

Fossil fuel as the beacon of industrialization emits carbon dioxide more than any other source of energy. Carbon dioxide emission among other Green House Gases is the dominant gas responsible for global warming and damaging impact of climate change. Given the enormity of the impact of climate change, the United Nations General Assembly in 2015 adopted 17 Sustainable Development Goals (SDGs) of which 'goal 13' was a call for climate action to mitigate the drastic effect of climate change by reducing global warming to 2°C above pre-industrial levels or 1.5°C by 2030. Shipping in the maritime sector accounts for over 80% of the global trade and hugely dependent on Heavy Fuel Oil (HFO) and emits about 2.7% of the global carbon dioxide. However, Global carbon dioxide (CO2) emissions from fossil fuel drop by 7% in 2020, due to the effects of COVID-19 lockdowns. It catalyzed alternative energy initiative and operation in the maritime sector; smacked the possibility of green shipping and an end to the industry dependence on fossil fuel. Against this Post-COVID-19 prospects, the study, therefore, assess the Post-COVID-19 emergent scenarios and level of progress in global decarbonization for sustainable development focusing on international shipping. The documentary method of research was adopted for the study while Win-Win Solution served as the conceptual framework. The study analyzed the efforts to decarbonize the shipping industry and determine if the maritime sector will likely achieve green shipping target by 2030.

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The influence of physico-chemical parameters on habitat ecology and assemblage structure of phytoplankton in Tehri reservoir (Uttarakhand), India

Rathi. P
Gurukul Kangri (Deemed to be University), India

The present study deals with the influence of physico-chemical parameters on habitat ecology and assemblage structure of freshwater phytoplankton in Tehri reservoir Garhwal (Uttarakhand) India. Habitat ecological variables play a major role in determining the diversity, abundance and occurrence of phytoplankton in reservoir. Physicochemical variables and phytoplankton genera were analysed on a seasonal basis for the period of one year from April 2018 to March 2019. Some important physiochemical parameters like pH, water temperature, electrical conductivity, total dissolved solid, turbidity, transparency, total alkalinity, dissolved oxygen, biochemical oxygen demand, chloride, phosphate, and sulphate were analysed. Overall 32 phytoplankton genera belonging to 3 classes were identified. Bacillariophyceae was dominant class followed by Chlorophyceae and Cyanophyceae at selected sampling zones. The maximum reading recorded by the Phytoplankton was 3771 individuals/L during winter at zone C, whereas minimum number 1327 individuals/L were recorded during the season of monsoon at zone A. The canonical correspondence analysis was used to find out the relationship among phytoplankton class and habitat ecological parameters and showed positive and negative correlations with each other.

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Morphodynamic state of beaches from Devbag-Achra, Sindhudurg, Maharashtra, West Coast of India

P T Hanamgond
Govindram Seksaria Science College, India

The coastline of Maharashtra is about 720 km long. The coastal ecosystem here is unique and divergent owing to the multi-geomorphological processes ranging from tectonic, fluvial, coastal to aeolian processes.

The area under study is around Malvan (Figure 1) stretches 30 km in length. It has serene and scenic beaches, exhibiting spits, barriers, islands and headlands. Sindhudurg Island and the coast, make it one of the busiest places for tourism. It is also regarded as one of the biodiversity hotspot of the country.

The present study area comprises the two long stretches of beaches- Achra-Tondavli (about 15km) and Malvan-Devbag (about 15km); one pocket beach at Chivla (about 1km); and one estuarine beach at Kolamb River mouth. 20 study sites were used for the beach morphological and textural study. The beach profiles were monitored on monthly scale initially and later seasonally. The sediments from the upper 3-4 cm surface were collected across all 20 locations at every 10 m interval from reference point seasonally, during monsoon 2008 (July), post monsoon 2008 (Nov); Premonsoon (May 2009); monsoon 2009 (July); Pre monsoon (April 2010); and monsoon 2010 (July), at different micro environments of the beach.

The beach profiles gave volume change (m3 m-1) for understanding the beach dynamic processes. The sediment samples were prepared for textural analysis following standard procedures using Graphic and moment measures.

The overall morphological changes indicate that the coast here experiences, the cyclic behaviour. The textural analysis indicates that - the sediments are finer than the Achr-Tondavli beach, they are deposited as graded suspension, under moderate to high-energy turbulence conditions. The alongshore sediment paths show northerly sediment transport during all the seasons. The cross-shore sediment movement shows cyclic behavior i.e., during monsoon it shows offshore transport and during fair-weather it shows onshore transport.

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Globalization and India's international trade: Does distance still matter?

Purva Yadav
Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, India

This paper attempts to capture the missing 'distance' puzzle in the globalization process driven by trade flows. It is widely recognized that the growing global economic integration process play a major role in the spatial restructuring of many countries at varying geographical scales. The paper illustrates a model of international trade flows that builds upon existing research on the geographies of global trade. Empirical results of the current study indicate that the basic and augmented gravity model provides a useful framework for understanding international trade. The evidence of map pattern in residuals across temporal scale is noted. The results further indicate the importance of distance in the Indian context. An identification of the patterns and determinants of India's international trade with 87 countries suggests that potentially important differences in regional demands and country specific factors may impact the trade interaction over the years.

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Groundwater quality and urolithiasis

Raafat Abdeldayem
Mansoura University, Egypt

Medical geology is a fast expanding field of research that investigates the co-occurrence of many pollutants in the environment and the resulting health hazards. The goal of this study was to determine the link between drinking water salinity and the creation of urinary stones (urolithiasis) in those who drink it, as well as the impact of water quality on urinary stone formation. Compared with neighboring areas, the prevalence of urinary stones in the study area selected. A total of 87 volunteers were recruited. Drinking water samples were taken from water sources used by clinically identified urinary stone patients and healthy people. Field measurements of physicochemical parameters were made on site during the sampling process. The concentrations of major and minor ions in the water samples were determined using other hydrochemical parameters. The water quality parameters in the patients' regions increased as the total dissolved salts (TDS) increased. The anions in the area were in the order of HCO_3-> Cl-> $SO4^{2-}$, whereas the cations were in the order of Ca^{2+} > Na^{+} > Mg^{2+} > K^{+}. The findings indicate that deep groundwater is of superior quality when compared with shallow water. The results suggest a significant risk of urolithiasis among the residents. To minimize the threats to human well being, public authorities should act immediately to supply clean drinking water to the residents.

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Water quality and its health impact in the prefecture of Mohammedia, Morocco

Rachida El Morabet
Department of Geography, LADES, FLSH-M, Hassan II University of Casablanca, Morocco

One of the major concerns of the world today is the sustainable management of water resources. The qualitative and quantitative sustainability is a necessity to meet the water demand in the face of strong demographic growth, increased industrial and agricultural activities, and global change.ThePrefecture of Mohammedia is a booming region with the extension of intensive irrigated agriculture and industrial zone in addition to the accelerated urbanization and the creation of thenewZenatacity within the Prefecture. This development is accompanied by an increaseddegradation of water resources, which affects, in turn, the socio-ecological system.In this review, we summarize and analyze recent studies about the qualitative and quantitative evolution of water associated with global change, with a focus on data from institutional reports, in addition to data from field surveys.The groundwater was found to have higher concentrations in indicating permeationof wastewater (presence of *E-coli*);whereas surface water sources were contaminated and crossed the permissible limits for safe drinking water quality at point of meeting wastewater discharge. Also, bacteriological concentration in groundwater validated groundwater contamination, especially in the vicinity of landfills.The results show a significant spatial variability in the quantitative (piezometry) and qualitative (physio-chemical, biological, and hydro-geomorphological quality) distribution in the Prefecture of Mohammedia. The number of water-borne diseases validated the impact of water quality on consumer'shealth. Further studies are needed to conduct an overall quality analysis of water resources based on the same parameters to serve as a reference for policy making regarding thesustainable management of water resources in the Prefecture of Mohammedia.

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Spatial financial inclusion/exclusion hotspots and its determinants in India: A district-level analysis

Rajat Singh Yadav and **Shiva Reddy Kalluru**
Gokhale Institute of Politics and Economic, India

Motivation: This paper aims to reduce financial inequality by investigating the absolute and conditional convergence hypothesis i.e. if the states are performing low in financial inclusion embark on catching up with higher financial inclusive states either without any opportunity or spillover or based on some factors. The study finds out financial exclusion trap locations.

Purpose: India launched its biggest financial inclusion drive by opening a free account with zero balance under the Pradhan Mantri Jan Dhan Yojana (PMJDY) flagship scheme. The progress of the scheme is with the increase in access to bank accounts. But, we notice the regional (spatial) variations in the inoperative accounts.

Approach and Methods: First, calculate the Financial Inclusion Index (FII) across 591 Indian Districts using RBI Indian Economy Database. Global Moran's I and Local Indicators of Spatial Association (LISA) analyses are employed to provide evidence of the existence of spatial dependencies in the changes in FII scores across the Indian districts.

Findings: FII scores converged by 16.8% by using socio-economic factors and 25.2% by using financial literacy factors as control variables. Spatial results show that banking services are associated with the pattern of spatial disparities of distribution of tribal population, who are likely to be less financially inclusive, in the district and the neighborhood effect exists with the low financial sound status population.

Policy Implications: The merits of this research are better suited for both political and economical discussion because once a local cluster is known as 'Hotspots' and 'Coldspots' i.e. Locations with high and low values of financial inclusion with similar neighbors respectively neighbors' position has been identified. Now, it is incumbent upon the local authorities to ascertain the cluster's source and reduce the financial inequality by providing financial accessibility, availability, and awareness, to achieve inclusive or sustainable growth in India.

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Geo-polymer reinforced concrete beam with low calcium fly ash

Ramesh Babu S[1] and **Alexander Gladwin Alex**[2]
[1]*Nalla Malla Reddy Engineering College, India*
[2]*Ethiopian Technical University, Ethiopia*

Cement production is accountable for billions of tons of waste materials. Researchers are trying to replace conventional cement with alternative cementation material to reduce carbon emissions and improve the overall efficacy. However, studies on eco-friendly materials with low calcium fly ash and different chemical compositions in structural performance are very limited.

The research aim of this study is to investigate the influence of Low Calcium on Geopolymer Reinforced Concrete Beam (GB) in flexural behaviour compared with Conventional Cement Reinforced Concrete Beam (CB). The following are the research objectives of this study.

To evaluate and to find the Flexural Strength of the Geo-Polymer Reinforced Concrete Beam (GB) and to compare it with the Conventional Cement Reinforced Concrete Beam.

To identify the suitability of the Geo-Polymer Reinforced Concrete Beam for the application. Materials and Methods of the study: Class–F Fly ashes have been used in Geo-polymer concrete. Low calcium fly ash, fine and coarse aggregates, and alkaline liquids are used for making Geopolymer concrete. The grade of concrete used is M20. The nominal mix ratio (1:5.5:3) of M20 grade, is the minimum grade of concrete as per I.S 456-2000.

For the analytical approach, the Finite Element method has been adopted using ANSYS APDL Programming in finding out the deflection of the beams and it is validated with the experimental investigation. 2D Beam 188 is the selected element type, which is based on Timoshenko beam theory (a first-order shear-deformation theory), which includes shear deformation effects. Transverse-shear strain is constant through the cross-section. The element includes unrestrained and restrained warping of cross-sections, i.e. apart from the regular six degrees of freedom, the seventh degree of freedom-warping magnitude can also be included. Stress stiffening is always included in geometrically non-linear analysis. Element type ignores Poisson's ratio, which affects the shear-correction factor and shear-

stress distribution. Beam does not account for coupling of bending and twisting at the section stiffness level.

In the Experimental Investigation, Specimens are made with the size of 125 mm x 250 mm

x 3200 mm and designed under reinforced sections with Fe 415 Steel bar of 10 mm Φ of two numbers at the top and 12mm Φ of two numbers at the bottom with the clear cover of 20 mm. 8mm Φ bars were used for two-legged stirrups at 150 mm CC. The yield strength of the steel bars is 435.6 N/mm2. The young's modulus of Geopolymer concrete (GB) was 2.21 X 104 N/mm2 and the Poisson's ratio is 0.12. The reinforced cement concrete control beams (CB) were designated as CB-1, CB-2 and CB-3. Similarly, the Geopolymer Concrete beams are designated as GB-1, GB-2 and GB-3. The two-point loads are applied at an equidistant of 500mm from the Centre on both sides. The load applied is in the steps of 2.5 KN.

Conclusion:

1. The average first cracking load of Geopolymer beam was around 22% higher than control concrete and it gives higher deflection, indicating the binding between inner matrixes of GB mix has more bond strength compared to conventional concrete.
2. In the service stage and yield stage GB exhibited better performance in the aspects of load-carrying and deflection compared to CB which shows GB have more ductility compared to CB because of its Modulus of Elasticity of geopolymer concrete beam.
3. The crack width increased gradually with an increase in load. In the case of GB, crack width increased slowly up to the service stage. However, when it reached the ultimate stage, it increased rapidly. The average Spacing between cracks in GB is more when compared to conventional concrete. It may be due to less porosity because of the finesse of fly ash.
4. The application of Low calcium Fly ash based Geo-polymer concrete was suggested effectively in the replacement of conventional concrete as it shows better performance and reduced Environmental issues. It gives better performance in all aspects by using industrial waste as a binder.

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Green alternatives of the future

Ranjan Dey and **Aditi Prabhune**
Department of Chemistry, BITS-Pilani K K Birla Goa Campus, India

Solvents are essential part of various industries such as chemical, pharmaceutical, textile, paint and pigment etc. Water is one of the key elements in variety of industries where it is used as solvent, in cleaning, washing and cooling etc. processes. Major industrial hubs include chemical, pharmaceutical, fertilizers, textile, dye, sugar mills, tannery, pulp and paper, paint and many more industries. The solvent usage by industries is about 80-90% of total mass and they also account 80-85% waste it produces. Over 500 million of wastewater is dumped into rivers from these industrial plants. The two largest rivers emanating from the Himalayas, viz., Ganga and Yamuna in India which have been instrumental in establishing the civilizations and subsequent industrialization along its banks of river has also been badly affected by this . Both the rivers are heavily contaminated with human waste and industrial contaminants. These industrial effluents contain hazardous toxins, heavy metal particles like arsenic, mercury, dyes and it reduces the BOD (Biological Oxygen Demand) of water body indicating degradation of entire aquatic biota along with the humans which are dependable on these water resource. These industries are also responsible for air pollution as most of these industrial solvents are Volatile Organic Solvents (VOCs) with high volatility, toxicity and environmentally hazardous. In the recent decades, active research has been undertaken to find better, greener and sustainable resources, and methodologies. Use of several benign solvents viz., water, polyethylene glycol and supercritical fluids have been proposed, along with deep eutectic solvents (DESs) and ionic liquids (ILs), to minimize the effects of pollution in air quality caused from effects of volatile organic solvents. Various projects like Namami Gange and Ganga Action Parivar (GAP), Yamuna Action Plan (YAP) are established which are directly working on river surface cleaning, sewerage treatment, wastewater management, conservation of biodiversity and public outreach and awareness. In this context, an attempt will be made to understand how these benign solvents may prove to be viable alternatives to the carcinogenic solvents in various industrial applications for sustainable development.

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Yield assessment of reservoirs for ungauged catchments using rainfall data

Rewa Bochare[1] and **R.K. Shrivastava**[2]
[1]*Prestige Institute of Engineering Management & Research, India*
[2]*S.G.S.I.T.S, India*

The present study proposes an empirical technique for the prediction of tentative yield expected from a reservoir propounded at any site in the study area. The proposed methodology was validated in two parts considering India as the case study region. In the first part, seventeen major river catchments of the country were examined to establish an empirical relationship between peak flow rate and average flow rate. The former was calculated using the rational formula while the latter was acquired from the WRIS portal. The generated equation provided the average streamflow value by using only the rainfall data of an aspiring reservoir location. In the second part of the validation, a mathematical model was established for computing the yield from a reservoir. The dependent variables were computed using the streamflow dataset of 212 sites, spread widely, across the country's geography. The results of the present study may prove to be beneficial for the reconnaissance planning of a reservoir. The proposed methodology may also be applied to other countries/regions to achieve similar results.

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Two contrasting resin chemistry from Rajasthan basin and their significance

R. Chetia[1,2] and **R. P. Mathews**[1]

[1]*Advanced Organic Petro-Geochemical Laboratory, Birbal Sahni Institute of Palaeosciences, India*
[2]*M.P.Singh Lab of Coal and Organic Petrology, CAS in Geology, Banaras Hindu University, India*

Resin samples from two mines namely, Barsingsar and Jalipa Mine from Bikaner-Nagaur Basin and Barmer Basin respectively, belonging to Paleogene lignite sequences of Rajasthan, western India were analysed for understanding their chemistry in light of their floral aspects. The terpenoid composition gives us characteristic and contrasting signature to understand the predecessors. The presence of high amount of sesquiterpenoids in both the mines hint to a non specific high land plant input. The sesquiterpenoid class compounds for Barsingsar samples include drimane, 8- Isopropyl-2,5-dimethyl-2,5-dimethyl-1,2,3,4 -tetrahydro naphthalene, cadalenes, norcadalenes, chamuzulene etc. The high abundance of diterpenoids like various unidentified abietane class compounds, 16,17,18- Bisnordehydroabietene, 14-Methyl-16,17-bisnordehydroabietane, podocarp-8,11,13-teiene-12-ol, Rosane, etc point to a conifer source where Podocarpacae is a probable source for the resin from Barsingsar. The major compounds identified in the Jalipa fossil Resin were 2,6-dimethyl-1,2,3,4-tetrahydro-naphthalene, α-muorolene, dihydrocurcumene, calamenene, 5,6,7,8-tetrahydrocadalene, cadalene and C30 cadinene dimers. The compounds identified for Jalipa Resins in the first group are C15 bicyclic sesquiterpenoids and the second group consists of their dimer products. The second group of compounds had a mass spectra corresponding to bicadinene products which are chemotaxonomic markers for angiosperm family Dipterocarpacae. The presence of two distinct genus markers in relative lignite sequences indicate the diversity palaeogene of India. The research provide a good scope to understand how various resin producing floral elements played their significant part in the tropical forests in South East Asia with the help of resin chemisty.

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Soil microbial properties and functional diversity in response to sewage sludge amendments

Dhanker R[1] and **Chaudhary S**[2]

[1]*International Institute of Veterinary Education & Research, India*

[2]*Central Institute for Research on Buffaloes, India*

Soil organic matter has vital role in maintaining important soil functions. Consequently, using sewage sludge as soil organic amendment is considered one of the agricultural practices for improving soil fertility, which is also a safe approach for its disposal. The present research was carried out to analyze the different microbial activities and functional diversity of agricultural soil with regard to sewage sludge application. A laboratory experiment was set up by taking the agricultural soil from Haryana Agricultural University fields and amended with 5, 10, 20, 30 and 50 t ha−1 of sewage sludge. It was observed that soil microbial biomass increased upto 60% and potential activities of dehydrogenase, alkaline phosphatase and urease enzymes increased upto 50–55% with increasing application rates of sewage sludge. In addition the community-level physiological profiling technique (CLPP) based on carbon source utilization was used to determine the microbial functional diversity of soil. The results indicated higher functional diversity of microbial population capable of exploiting different carbon substrates with sewage sludge application. These results are imperative for improving the approach of sewage sludge application to the agricultural soil in consideration of increasing soil fertility with reducing the use of chemical fertilizers.

Identification of potential barriers of EVsCI using EFA

Ruchita
Bharti School of Telecommunication Technology and Management, Indian Institute of Technology Delhi, India

Electric vehicles (EVs) reduce dependency on traditional fuel and these also reduce CO2 and other greenhouse gases emission with respect to the traditional transportation system. However, manufacturers have to face some challenges/barriers in the way of providing proper EVs and EVs Charging Infrastructure (EVsCI). In this study and research work, a framework is prepared with the help of a literature review with systematic literature review (SLR), experts' opinions, stakeholders' theory, and transition management concept to identify and analyze the barriers against EVsCI. Twenty barriers in the way of EVsCI have been identified for smart transportation management in developing countries. Then, an exploratory factor analysis (EFA) methodology has been applied to reduce the identified barriers forming a lesser group of the barriers to get hidden constructs and categorizing them in a four-level transition management framework. This research may help policymakers to frame policies to encourage manufacturing and to minimize barriers of EVsCI. The paper focussed to identify the barriers of EVsCI, to form a small group of barriers, and to validate four-level transition management.

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Eco-friendly bio polymer based solid-state electrolyte and its application to storage devices

S. Jone Kirubavathy and **K.Suvarnna**
Department of Chemistry, PSGR Krishnammal College for Women, India

Objective and scope: To develop a bio polymer based solid state battery which is ecofriendly, a good alternative for the liquid electrolytes used in present day batteries facing safety issues.

Methods and results: A novel Solid – State biopolymer electrolyte was prepared from the biomaterial Corn Silk Extract(CSE) by blending with polyvinyl alcohol and different concentration $MgCl^2$ by opting solution casting technique. The maximum ionic conductivity of 1.747 × 10-5 Scm^{-1} for the blend pure biopolymer and 1.282 × 10^{-3} Scm^{-1} for the biopolymer electrolyte was obtained from the AC Impedance Analysis. The obtained biopolymer electrolyte is characterized by Fourier transform Infrared spectroscopy (FT – IR) to look into the complex formation of the biopolymer blend and the salt. The increase in the amorphous nature of the novel biopolymer electrolyte at a composition of 1g PVA + 0.9g CSE + 0.45wt% $MgCl^2$ is explained by the XRD pattern. The impact of addition of different concentration of $MgCl^2$ on the Glass transition temperature was provided by the differential scanning colorimetry (DSC) process. The electrochemical potential window of the biopolymer electrolyte with maximum conductivity is obtained as 2.65 V in linear sweep voltammetry(LSV). Transference number is calculated from Wagner's and Evans polarization technique. A primary Mg – ion battery is constructed with an open circuit voltage of 1.95V at room temperature.

Conclusion: With the development efficient solid electrolyte for battery using biowaste materials, this promise to have a wide potential for sustainable energy storage. Such solid electrolytes containing green , biodegradable components will be an alternative solution to the ecological problem of electronic waste.

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Foamed concrete construction blocks using industrial wastes: A sustainable building material

Sajan K Jose[1], Mini Soman[2] and **Sheela Evangeline Y[3]**

[1]Department of Civil Engineering, LBS Institute of Technology for Women, APJ Abdul Kalam Technological University, India

[2]Department of Civil Engineering, College of Engineering Trivandrum, India

[3]Department of Civil Engineering, Mohandas College of Engineering, India

Country burnt bricks or hollow/solid concrete blocks are used as infills for reinforced concrete framed structures in the present construction scenario. There is substantial depletion of natural resources during the production of conventional bricks, which create environmental pollution due to burning of bricks. Also, for the production of hollow/solid cement concrete blocks, large quantities of cement and natural aggregates are being used. This has led the researchers to find a greener solution, which is more feasible, lighter and greener alternate material for the infills, to overcome all these issues. One of such feasible solutions is the development of foamed concrete. Foamed concrete (FC) is such an innovative and versatile material, which consists of a cement-based mortar having minimum 20% of volume filled with air. This research focuses to modify the existing method of production of foamed concrete to overcome the ill effects of brick production and other block production, with the usage of large quantities of industrial waste materials. Foamed concrete blocks of densities less than 1800 kg/m3 with reasonable compressive strength can be produced with these waste materials. The effective consumption of industrial wastes for the production of FC lead to preservation of natural resources, solving disposal issues of these wastes. FC is found to be economically viable, light in weight, durable, thermally resistive as well as environmentally sustainable. This research focuses on the feasibility of utilizing the industrial waste materials such as fly ash and GGBS as partial substitute for cement and quarry dust as substitute for fine aggregate. The influence of these waste materials on foamed concrete and the development of properties like compressive strength, dry density, water absorption and thermal conductivity were studied.

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Assessment for increase in vegetation / tree cover through dry afforestation in Samarkand forest of Chakwal forest division through remote sensing

Sajid Rashid Ahmad and **Ansir Rasool**
College of Earth and Environmental Sciences, University of the Punjab, Pakistan

The unique landscape of Salt Range cover scrub forests, which have various environmental value besides comprising important watershed areas and habitat of flagship wildlife species of Punjab Urial. The study areas is located in district Chakwal called Samarkand Forest.

Samarkand Forest is situated in District Chakwal. It is located between 32.7621 North Latitude and 72.5385 East Longitude. This forest comes under category D due to its low vegetation cover. It is located in the south of Chakwal district. Samarkand is classified as unclassed forest. The terrain of Samarkand Forest is mountainous and rocky, interspaced with flat lying plains, its altitude is approximately 2014 ft.

The main theme of the project is to study the potential and scope of the eco services. Methodology was devised to determine eco-services of the study area and increase in cover forest area by boundary delineation, Cover Assessment through two different year satellite imagery / forest maps and Identification of HCVA area in Samarkand Forest of salt range.

Firstly boundary of the Samarkand Forest was drawn using ArcGIS based on GPS points collected during survey, then calculate the area of the demarcated boundary. According to the map, calculated area of the forest boundary on basis of GPS field survey is 5366 acres. In spite of GPS survey, there is a difference in the area of forest boundary. They are few settlements has been found near Samarkand Forest. The villages located around project site depending on the goods and services provided by the project area. The flora and fauna of Samarkand Forest was also identified with their distribution and key species.

To assess the increase/decrease in forest cover after dry afforestation we prepared final classification/cover assessment thematic map by two year Satellite image which is divided in to 04 major classes i.e., forest crop, grass/bushes, built-up and blank areas. The classification result of satellite image of two year 2015 and 2018 of Samarkand Forest showed that Forest cover were increased

by 5% after dry afforestation In addition, according to working Plan of Chakwal Forest Division four classes in density of stocking, the classified Image of the Samarkand Forest lies under category D as Forest cover is only 24.4% of the total area while other land cover classes are 75.6 percent of the total area.

The high conservation value areas with respect to flora and fauna were also delineated using point density and Directional distribution analysis. Point density indicates the density as well as spatial pattern of fauna and flora. Directional Distribution analysis was carried out for mapping the corridor of fauna species by using the GPS points collected during survey.

High Conservation Value Areas (HCVAs) are natural habitats, which are of outstanding significance or critical importance due to their high biological, ecological, social or cultural values. All natural habitats possess inherent conservation values, including the presence of rare or endemic species, provision of ecosystem services, sacred sites, or resources harvested by local residents. Samarkand Forest importance with respect to High Conservation Value Areas (HCVA)

The study shows that Samarkand Forest is one of forest consider as rich in biodiversity in salt range. It has very low vegetation cover, as wildlife is dependent on vegetation for feeding and grazing. Due to illegal hunting and shooting in the area causes threat to the wildlife species. Its endemic species is Urail, which is rapidly decreasing due to illegal hunting. Other species, which is under threat, is partridge. Major tree species exist in the delineated HCVA are Phulai (Acacia modesta), Behkair (Adhatoda viscosa), Beri (Zizyphus mauritiana).

Therefore, conservation of this rich biodiversity area is needed. "Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water". The conservation of its biodiversity, the survival of many species and habitats can be ensured, which are threatened due to anthropogenic activities. The results leads to base our research for identification local ecosystem services for betterment of local community and sustainable development of forest areas.

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Recycling of glass waste as fine aggregate in concrete

Sajjad Ali Mangi and **Shahid Ali Shaikh**
Department of Civil Engineering, Mehran University of Engineering & Technology, Pakistan

The concrete is the second most consuming material after the water on the earth. It largely contains the aggregates like fine and coarse aggregates. However, more consumption of fine aggregate could result in the depletion of natural resources. Therefore, this study considered glass waste as fine aggregate in concrete. The glass waste was collected from junkyard then grinded manually and converted into the fine aggregate. It was initially sieved through 4.75mm sieve. Afterward, different series of concrete mixes were prepared with different percentage replacement like 0%, 10%, 20% and 30% by the weight of fine aggregate. The concrete samples were cured in water tank for the period of 7 and 28days then tested for the compressive and tensile strength performances. It was observed through the laboratory findings that the 20% replacement gives the optimum performance. It was noticed that around 25% increment in compressive strength at 28days. This study indicated that the recycling of glass waste in concrete could give the better performance and solve the waste handling, environmental issues related to the glass waste.

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Heat flow estimation and quantification of geothermal reservoir of a basement terrain using geophysical and numerical techniques

Samuel O. Sedara[1] and **Olusegun O. Alabi**[2]

[1]*Department of Physics and Electronics, Adekunle Ajasin University, Nigeria*
[2]*Department of Physics, Osun State University, Nigeria*

The occurrence and manifestation of warm and hot springs gives a hint to the availability and abundance of geothermal resources in Nigeria. So for the first time we estimated and quantify the geothermal energy resource potentials in Ikogosi Warm Spring area (IKGWS) and environs using geophysical and Numerical methods. The results from heat flow computation from aeromagnetic investigations and volumetric estimation confirmed there are zones in the IKGWS with anomalous heat flow and great prospects of geothermal energy for direct and indirect applications. The heat flow estimated for the IKGWS and environs ranged from 75 to 127 mW/m2 with an average value of 100 mW/m2 while temperature gradient varied from 28 to 48 °C/Km with a mean value of 38 °C/Km. Also the Curie point depth (CPD) estimated ranged from 12 to 21 km with a mean value of 16 km. The power output of 2 MWe can be produced with 90% confidence and production greater than or equal to 3.7 MW with 5% confidence. The IKGWS isolated will produce 0.9 MWe if the recoverable heat is used for 25 years. The outcomes implied that IKGWS can primarily sustain a 0.9 MW power plant for a period of 25 years and likely extension will be subjected to further well-defined drilling and site data performance availability. The simulation results show that an estimated stored heat in-place of 0.65–1.95 × 1018 J can be expected from the inferred resource areas at 90% probability. This figure is equivalent to electric power generation potential of 3.2–9.6 MWe or annual electricity generation of 25–76 GWh at the same probability rate. Therefore Nigeria may appear on the global geothermal map by generating power and direct utilization of geothermal energy in IKGWS.

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Modeling riverbank erosion - An analytical approach

Sanchayan Mukherjee
Kalyani Government Engineering College, India

Rivers all over the world have unique features of their own. Rigorous and meticulous experimentation may help quantify the riverbank erosion to a great extent. However, results of field studies have their own limitations due to the uniqueness of the river. Therefore, application of the result obtained out of thorough investigation pertaining to a typical riverbank often comes out to be a difficult proposition for others. A general approach to the phenomenon is the need of the hour for estimation of the magnitude of erosion. A particle on a bank is subjected to a number of forces of considerable significance. A force analysis involving forces like cohesive force, viscous force, pore water pressure force, gravity force, seepage force and so on, leads to determination of the escape velocity of the particle. Also, there is a variation of water level in the river that necessitates use of the principle of conservation of angular momentum. This velocity is a pre-requisite to find out volumetric bank erosion rate. A planar model called "Truncated Pyramid Model" may successfully be used towards that direction. The essence of the model lies in the concept of collective stability of a group of particles. The escape velocity is arrived at considering the dynamic equilibrium. The results, when validated against some already published results, prove the efficacy of the model. Thus, it opens the door for further investigation with more degrees of freedom.

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Thermophysical properties of cement mortar containing waste glass powder: The case of Morocco

S. Belarouf and **A. Samaouali**

Team Thermodynamic-Energy Energy Research Center, Department of Physics Faculty of Sciences, Mohammed V University in Rabat, Morocco

The objective of this research is to provide a thermophysical characterization of a new ecological mortar. This material is characterized by the partial replacement of cement by recycled glass. Cement was partially substituted (20.40, 60% by weight) by glass powder with a water/cement ratio of 0.4. The glass powder and the samples were analyzed using a scanning electron microscope. Thermophysical properties, such as thermal conductivity and volumetric specific heat, were measured experimentally in the dry and wet (water-saturated) state. These properties were determined as a function of the percentage of glass powder using a CT-Meter at different temperatures from 20 ◦C to 50 ◦C in a temperature controlled box. The results show that the thermophysical parameters decreased linearly when 60% glass powder was added to the cement mortar

The use of waste glass powder in place of cement affects the thermophysical properties of the cement mortar due to its porosity compared to the control mortar. The results indicate that thermal conductivity and volumetric specific heat increase with increasing temperature and/or decreasing substitution rate. Therefore, the addition of waste glass powder can significantly affect the thermophysical properties of cement mortar.

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The impact of climate change on coastal geomorphology and erosion; An overview of Indian coast

Sathish Sathasivam and **R.S.Kankara**
National Centre for Coastal Research (NCCR), Ministry of Earth Sciences, GOVT.of India, India

Coastal processes (erosion/accretion) are one of the most serious issues facing coastal zones, and the changing coastline is a source of concern. As shown in a recent report, about 23% of the Indian mainland's shoreline is eroding to varying degrees of severity, ranging from minor to severe, with up to 1248 km of shoreline is eroding. However, due to various factors such as longshore currents, erodibility of beach material and composition, nearshore seabed shoal, slopes, and storm wave energy, shoreline orientation, shore protection structures, and so on, the rate of erosion varies with time and location. Erosion and accretion are two major issues in shoreline management that are caused by natural and man-made events and coastal erosion causes morphological changes in a variety of ways. Seasonal/annual morphological changes are revealed by shoreline variations and sediment transport studies. These studies are vital for understanding the characteristics of accretion and erosion as a result of climate change, which will aid us in understanding changes in oceanographic processes in coastal areas and identifying the evolution changes of the coastline. Coastal processes that influence sediment transport and result in coastal erosion can aid in the development of environmentally-friendly coastal protection solutions. Detailed field surveys have been carried out, which included the collection of oceanographic and geological data and the deployment of instruments. According to the findings, as a result of climate change, the majority of the study region is experiencing coastal erosion and various types of erosional landforms have been observed. Seasonal morphological variations, as well as the impact of oceanographic processes such as erosion and accretion along the beaches, are important in understanding the nature of the beach and the changes that occur over time. It's essential to identify areas prone to long- and short-term erosion, as well as to point out the causes of erosion. Thus, shoreline changes are a major issue along the Indian coast.

Figure 1: *Coastal Erosional Geomorphological landform in Muthdwarka Coast (Gujarat, India)*

Table 1: *Beach Sediment characteristics of Muthdwarka Coast (Gujarat, India)*

DOC	Lat (in DD)	Long (in DD)	Sample ID	D50 (in phi)	Folk and Ward (phi)				Folk and Ward's description			
					Mean	Sorting	Skewness	Kurtosis	Mean	Sorting	Skewness	Kurtosis
Nov / 2016	20.75889	70.66020	BS - Muldwarka	1.669	1.609	0.734	-0.055	0.677	Medium Sand	Moderately Well Sorted	Symmetrical	Mesokurtic
			BL - Muldwarka	0.761	0.761	0.168	0.027	0.779	Medium Sand	Moderately Well Sorted	Fine Skewed	Mesokurtic
			FS - Muldwarka	1.697	1.676	0.645	-0.034	0.849	Medium Sand	Moderately Well Sorted	Fine Skewed	Leptokurtic

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Textile wastewater treatment via ozonation pre-treated with ultrasound cavitation and Fenton-like advanced oxidation processes

Satyajit Shukla

CSIR-National Institute for Interdisciplinary Science and Technology (NIIST), Council of Scientific and Industrial Research (CSIR), India

The Common Effluent Treatment Plant (CETP) at the Kerala Industrial Infrastructure Development Corporation (KINFRA), Kannur, Kerala, India daily treats one lakh liters of textile effluent, containing azo reactive dyes, with the chemical oxygen demand (COD) removal of almost 100%. Nevertheless, large amount (80-100 kg per day) sludge is produced in the stage-1 facility, due to the involvement of chemical and biological processes, which creates handling, storage, transport and reuse issues. Hence, the present work primarily focuses on treating the KINFRA effluent for the maximum COD removal without the generation of any solid sludge. Advanced oxidation processes (AOPs), such as the modified ultrasound (US) cavitation, Fenton-like, and ozonation (O3), have been utilized as stand-alone techniques for this purpose. Moreover, the modified US cavitation and Fenton-like AOPs have also been employed as pre-treatment methods for the post-treatment with the O_3 process which has been conducted at the varying O_3 flow rate (2-6 g h^{-1}). The US cavitation process has been modified by investigating the effect of various parameters, such as the US power (50-250 W), initial effluent pH (2-10), and O_2 flow rate (1-4 L min^{-1}). On the other hand, for the development of Fenton-like AOP, flyash (FA)-Pd composite particles have been synthesized via an electroless process and utilized as activator to activate the various oxidants such as the persulfate ($S_2O_8^{2-}$) and hydrogen peroxide (H_2O_2) to generate the radical-ions (•OH and O_2•-) for the decomposition of azo reactive dyes present within the textile effluent. The concept of mixed oxidants has also been utilized for the treatment of KINFRA effluent via the Fenton-like method. It has been observed that although the maximum COD removal (93%), without the sludge formation, is obtained by using the Fenton-like process as a pre-treatment and O_3 as a post-treatment, the stand-alone O_3 process which provides the COD removal of 86-90%, without the sludge formation, appears to be the most superior for the treatment of textile effluent at the commercial level since it can bypass the need to synthesize and use the large amount of FA-Pd based catalyst.

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Exemplifying endophytes of banana (Musa paradisiaca) for their potential role in growth stimulation and management of Fusarium oxysporum f. sp cubense causing panama wilt

Ajit kumar Savani[1], Ashok Bhattacharyya[1], Robin Chandra Boro[2], K.Dinesh[3] and **Emani Rajeswari[4]**

[1]Department of Plant Pathology, Assam Agricultural University, India
[2]Department of Agricultural Biotechnology, Assam Agricultural University, India
[3]Department of Plant Pathology, Central Agricultural University, India
[4]Department of Plant Pathology, PJTSAU-Rajendranagar, India

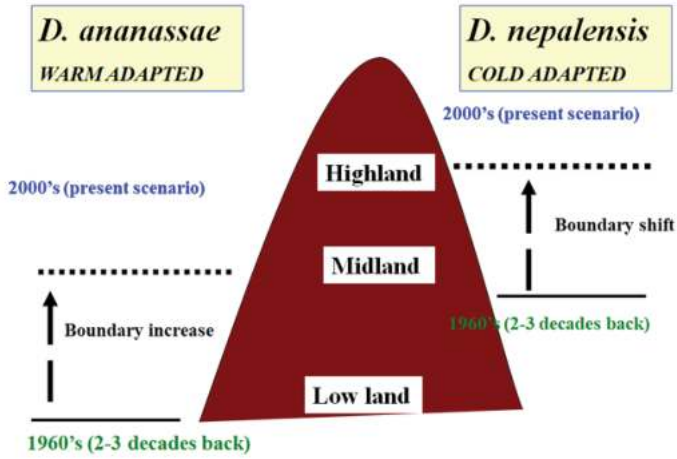
Banana (Musa paradisiaca) is one of the major staple food crop for millions of people in Central, East, West Africa, Latin America and Caribbean islands. In 2016, world production of bananas and Musa spp. was 148 million tonnes, led by India and China with a combined total (only for bananas) of 28 per cent of the global production. In India, banana ranks first in production and among fruit crops, area wise it ranks third after mango and citrus. The production of banana accounting for 30.4 million tonnes from an area of 0.86 million ha with an average productivity of 35.4 tonnes/ha (Horticultural Statistics at a Glance, 2018). Among the different fruit crops available commercially worldwide, banana is also considered as "Poor man" apple in tropical, sub tropical and the under privileged nations of Sub-Saharan Africa. At present India, contributes approximately 21 per cent of total global banana production thus emerged as one of the largest producer of banana globally (Thangavelu et al., 2019). However, during cultivation banana plantains are attacked by several biotic stresses such as diseases, insect pests and nematodes which hinder its production. Among the diseases that are affecting banana cultivation, Fusarium wilt caused by Fusarium oxysporum f. sp. cubense (Foc), is considered as one of the most important yield limiting diseases in the tropical and subtropical regions of the world (Ploetz, 2015). Historically the Fusarium wilt, also known as "Panama wilt" is the main culprit in destroying Gross Michel cultivar in Central America during 1950s (Dita et al., 2018). In

the present study, potentiality of endophytic microorganisms such as Rigidiporus vinctus AAU EF, Trichoderma reesei UH EF and Sphingobacterium tabacisoli UH EB in the management of panama wilt and growth promotion of banana was assessed through, artificial inoculation. During the study, a total of 220 bacterial and 110 fungal endophytes were isolated from root, pseudostem and leaf samples of banana, and they were evaluated against Fusarium oxysporum f. sp cubense causing panama wilt. Out of total 330 bacterial and fungal endophytes, only five endophytes exhibited antagonism against Fusarium oxysporum f. sp cubense, out of which only three isolates, namely Trichoderma reesei UH EF, Rigidiporus vinctus AAU EF and Sphingobacterium tabacisoli UH EB, produced Indole acetic acid, siderophore and Hydrogen cyanide, except one bacterial strain Sphingobacterium tabacisoli UH EB does not produced Hydrogen cyanide. Furthermore, these three endophytes were identified through cultural and morphological characteristics as well as by the sequencing internal transcribed spacer (ITS) and 16S rRNA gene sequences analysis for bacteria respectively. The response of host plant to endophyte inoculation was assessed by measuring the change in four growth parameters; plant height, pseudo stem girth (diameter), number of roots and total number of leaves. The application of endophytes, irrespective of isolate and treatment type promoted the overall growth of the plant growth when compared with diseased plants with significant higher values recorded for all parameters assessed. The endophytes reported as growth promoters were found to have significant inhibition effect on Foc which can evidenced with lowest AUDPC values and epidemic rate at 99.09 units2 and 0.02 unit d-1 respectively.

Climate change & range expansion in Drosophilids

Seema Ramniwas and **Divya Singh**
Chandigarh University, India

During the last century, the earth's average temperature has increased by 0.3 to 0.6 °C. This increased temperature has resulted in the reorganization of fauna. In environments with varying temperatures, phenotypic values must be adjusted to meet environmental demands. In ectothermic Drosophilids, thermal selection is a very significant factor affecting phenotypes (i.e., genetic effects) as well as induced effects on phenotypes (i.e., plastic effects). According to climate data for the last fifty years, average temperatures in the Western Himalayas have changed significantly, impacting Drosophilid distribution and boundaries. The distribution of D. nepalensis in lower ranges has significantly declined; however, D. ananassae has been introduced to lower to mid mountainous ranges. Comparing fecundity, hatchability, and viability at different growth temperatures also revealed that the traits showed significant decreases at 17 °C in D. ananassae and at 25 °C in D. nepalensis. Hence, these recent range changes for these two species are genetically influenced by ecophysiological and plasticity-influenced by life history traits. The results of our research indicate that thermal plasticity can be species-specific and that climate change might cause such traits to not match the changing environment. As indicators of habitat changes due to changing climatic conditions, D. nepalensis and D. ananassae can be considered. Biologists who study the evolution of life can offer unique insight into the effects of climate change on earth's biodiversity.



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Prioritization of sediment yield at sub watershed level using SWAT model in Finca'aa watershed, Abay Basin, Ethiopia

Seifu Kebede Debela
Jimma Institute of Technology, Jimma University, Ethiopia

Soil loss is one of the most important concerns that experts are looking into for successful watershed management. The goal of this research is estimate the spatial sediment yield and identifies hotspot area at the sub-watershed level using soil and water assessment tool (SWAT) model in the case Finca'aa watershed in the Abay River Basin, Ethiopia, from 1999 to 2017. Constructed rating curve from measured discharge-sediment loading was used to generate sediment data for the calibration and validation process. Model sensitivity analysis, calibration, and validation were performed using the Sequential Uncertainty Fitting version-2 (SUFI-2) technique. The calibration and validation are based on adjusted sediment sensitive parameters from 2001 to 2009 and 2010 to 2017, respectively. The coefficient of determination (R2) and Nash–Sutcliffe (ENS) through calibration and validation period were 0.84 and 0.79 and 0.79 and 0.74, respectively. This showed that, the model has strong capacity to predict annual average sediment yield and identify vulnerable locations at the sub-watershed level from the watershed. As a result, yearly average soil loss for the entire watershed is 41.2t/ha/year and sub-watersheds (1, 8, 11, 14, 17, and 20) are among the 21 sub-watersheds with very significant soil erosion, contributing roughly 28 percent of the watershed's sediment yield. Primarily, greater attention for conservation should be given for these sub-watersheds. The outcome is very important for planners and resource managers in terms of immediate and long-term planning through integrated water resource management (IWRM).

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Assessment of terrain stability zones for human habitation in Himalayan Upper Pindar River Basin, Uttarakhand using AHP and GIS

Senjuti NANDY
Independent Researcher, Santiniketan, India

Stable and vulnerable free terrain is always preferred for human habitation. Therefore, delineation of terrain stability zones is very much essential for the development and growth of planned and sustainable settlement habitation in any region. To assess the terrain stability for human habitation of the Himalayan Upper Pindar River Basin, Uttarakhand, a systematic regional planning approach is used based on a multi-criteria evaluation framework. It is analysed with the help of the analytical hierarchy process (AHP) combined with geographical information system (GIS). Combine effect of twelve parameters or criteria, i.e., landslide-prone areas, Peak Ground Acceleration (PGA), average slope, geology, soil, snow-affected area, relative relief, rainfall, Topographic Wetness Index (TWI), altitudinal zone, dissection index, and vegetation through AHP method, reveals a great variety of terrain stability in the spatial level of the study area. According to the final thematic map of terrain stability zones, the whole region is classified into five zones, namely stable, moderately stable, moderately vulnerable, vulnerable, and highly vulnerable. 19.31% area of the south-western part of the basin have stable terrain compared to approximately 19.64% highly vulnerable zone of the study area for human habitation in the north- east. The moderately stable and the moderately vulnerable terrain are noted in 20.92% and 19.45% of the study area, respectively. Thus, from the analysis, regions of the basin with high stability terrain for human habitation and growth of settlement are identified with the AHP model and the final result may be drawn as the vulnerability of terrain is gradually decreasing from the north-eastern part of the basin to the south-western section.

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Investigation of different feature extraction methods for intelligent diagnosis and classification of plant leaf diseases

Seyed Mohamad Javidan[1], Ahmad Banakar[1], Keyvan Asefpour Vakilian[2] and Yiannis Ampatzidis[3]

[1]Department of Biosystems Engineering, Tarbiat Modares University, Iran
[2]Department of Biosystems Engineering, Gorgan University of Agricultural Sciences and Natural Resources, Iran
[3]Agricultural and Biological Engineering Department, Southwest Florida Research and Education Center, University of Florida, USA

Plant diseases are serious causes in reducing quality and quantity of productions. Visual evaluation of plants by human observers is time consuming, costly and prone to error. Disease assessment and plant maintenance require new and innovative methods to meet the challenges in the field of agricultural production. In this regard, sensors and imaging techniques have shown great potential in creating new approaches to plant pathology interactions and the diagnoses of plant diseases. Advances in agricultural technology have created opportunities for the diagnosis and non-destructive classification of plant diseases. There are many advances in computer vision that help identify and classify plant diseases automatically. A classifier diagnoses plant as healthy and unhealthy with the given features (color, texture, and shape) as input to automatic diagnosis. Accuracy is the main parameter that every researcher uses to calculate the performance of the model. The accuracy of the classifier depends primarily on the features that are extracted; therefore, feature extraction plays a vital role in identifying a disease. Proper selection of the correct features leads to high diagnostic accuracy. Feature engineering in Machine Learning and Deep Learning are the two main types of feature extraction methods which will be explored in this research.

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Rural – urban interaction in Bangladesh: Changes in rural households' economy amidst covid-19 pandemic

Shahadat Baser
Department of Geography and Environment, University of Dhaka, Bangladesh

In the recent decades, rural-urban linkages have been attaining importance as a means of making spatial balance between the two ends. These two parts cannot be separated rather they are closely linked with each other even in pandemic. The study explores the nature interactions between rural households and urban areas and changes the characteristics of rural households' economy in the pre and post COVID-19 situation. An empirical study was conducted that shows the changes in population dynamics and in rural households' economy as results of rural-urban interactions and COVID-19 effects. The findings reveal that a significant change in the population characteristics occurred in rural areas before pandemic. The study area shows to be an outmigration area due to many rural constraints like landlessness, riverbank erosion and flood vulnerabilities in one hand and urban pulling powers on the other. The results also show that a significant number of urban centers close by, particularly the small ones, are directly linked to the livelihoods of rural people. The economic conditions of rural households are changing rapidly due to urban connections. However, COVID situation inverted the situation drastically. Traditional agrarian households largely turned to mixed income earners both from rural and urban centers. Those households having no links with rural lands are absolutely linked with urban areas and shows terrible situation in COVID waves. Furthermore, there are still some households which make their livelihoods from rural areas only. These households are economically vulnerable to various rural conditions and environmental interfaces like COVID-19 impacts. The households that are connected to the urban centers and maintain money flow to rural areas are in a stronger economic condition than those that draw incomes only from the villages. Therefore, the study confirms that the rural urban linkages have been playing a vital role in the diversification of livelihoods patterns of rural people and their households' economy even in COVID-19 Pandemic.

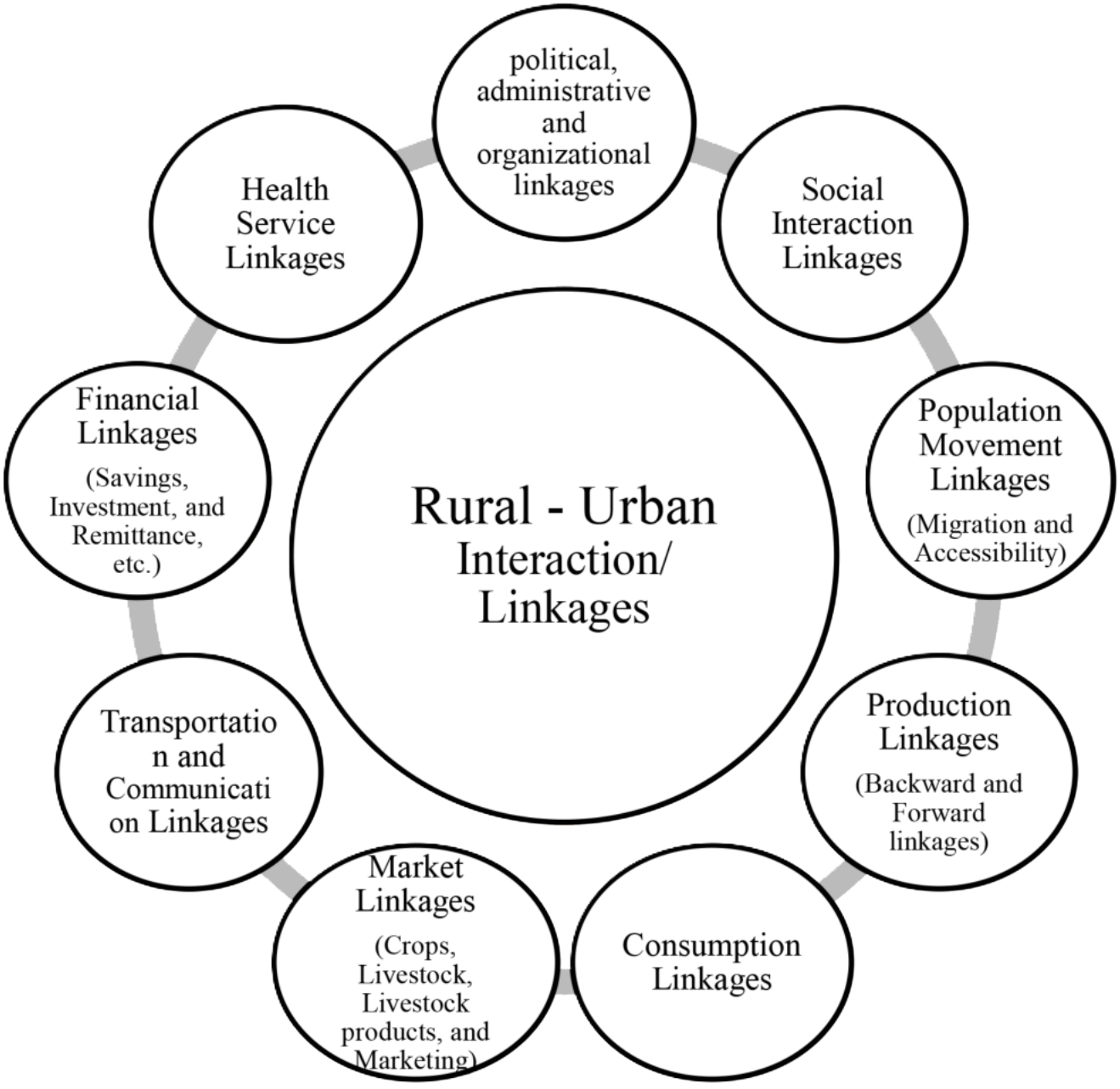

Figure 1. *Existing Interaction/ Linkages between rural and urban areas*

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Assessing the potential sites prone to invasion of Lantana camara under the climate change scenario in Jharkhand

Sharad Tiwari
1Institute of Forest Productivity, India

Present study elucidates the potential distribution of Lantana camara, in Jharkhand, eastern India, for present (2020) and the future (2050) climatic conditions under different Representative Concentration Pathways scenarios (RCPs). The study analyses the present distribution range of L. camara in eastern India and assess the potential areas prone to its further infestation in the future under the climate change scenario. Study revealed that about ~13% of the geographical area of Jharkhand is currently under the threat of invasion of L. camara, and depending upon RCPs, it may expand up to 20-26% by 2050. Study revealed the prominent distribution of L. camara in sub zone V (~22%), sub zone IV (~11%), and sub zone VI (~4.5%). Future projection (2050) indicates a possible expansion of its distribution range across all agro-climatic sub zones with dominance in sub zones V and IV. Variable Bio_4 (temperature seasonality) contributed most in limiting the L. camara distribution for current and future scenarios across all RCPs. Suitable habitat for L. camara mostly occurred under natural vegetation and agriculture landscape. In the present study we have attempted to assess the habitat adoptability of other perennial invasive species Chromolaena odorata compared the potential invasion scenario of these two major invasive species in the region. The study revealed, wide distribution across all the agro-climatic sub zones of Jharkhand, mostly in open and disturbed areas under natural vegetation and agriculture landscapes. Future projections for the year 2050 suggest a continuous increase in the infestation range across Jharkhand and calls for effective initiatives to combat its further invasion.

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Understanding contents of filled-in Bangla form images

Showmik Bhowmik[3], Rajdeep Bhattacharya[1], Samir Malakar[2], Soulib Ghosh[1] and **Ram Sarkar[1]**

[1]Jadavpur University, India
[2]Asutosh College, India
[3]Ghani Khan Choudhury Institute of Engineering and Technology, India

With a wide variety of forms being generated in different organizations daily, efficient and quick retrieval of information from these forms becomes a pressing need. The data on these forms are imperative to any commercial or professional purpose and thus, efficient retrieval of this data is important for further processing of the same. An automatic form processing system retrieves the content of a filled-in form image for useful storage of the same. Despite a large population of the world speaking in Bangla, to the best of our knowledge, there is no significant research work found in literature which deals with form data written in Bangla. To bridge this research gap, in the present scope of the work, we have developed a system that addresses four important aspects of processing of form data written using Bangla script. Our work has primarily been divided into four major modules: touching component separation, text non-text separation, handwritten printed text separation and alphabet numeral separation. The vital problem of touching component separation has been addressed using a novel rule-based method. For text non-text separation, handwritten printed text separation and alphabet numeral separation, we have used a machine learning based approach using feature engineering where the model for each case has been finalized after exhaustive experiments. Further, in each of the last three modules, we have applied some new features along with some existing features to appropriately tune the modules to obtain optimum results. Notably, we have also prepared a self-made database of filled-in forms. To create different training models, first the filled-in form images are binarized, and then different types of components are colored uniquely to obtain images which act as the ground truth for our reference. Evaluation of modules on the said database produces reasonably satisfactory results considering the complexity of the research problem.

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A Comparative Study of William Wordsworth's "Home at Grasmere" and Li Bai's "Sitting Alone on Mount Jingting" and "Drinking Alone under the Moon"

Shuo Han
Xi'an Jiaotong-Liverpool University/Xi'an Polytechnic University, China

Human emotions that stem from their nature are the same in spite of the differences in their nationality, race, gender, educational style, age, etc; they are also irrelevant to the historical backgrounds, social customs, cultural norms, etc. Humanity is actually about the commonality and interconnectedness of human behavior. These shared emotions are universal in reality, such as, a smile after appreciating the beauty of the sunset, a tear shed while seeing a flower unfolding its petals, or a sigh after the departure of the migratory birds. The core of ecological thinking mode is that everything is connected to everything else. An eco-critical reading of literary works is to transcend these artificial divisions and classifications and to re-establish the internal links among these texts. This work is a comparative study of a British Romantic poet William Wordsworth's poem and a Chinese Romantic poet Li Bai's poem from an ecological perspective. Through textual analysis, it intends and tries to highlight the internal link between the poems of these two poets by adopting an ecological stance. In the meantime, it also attempts to shed light on the perception of Romanticism by discussing the selected texts relevant to this concept within an international scope (both the East and the West). There are not enough detailed examples in the current literature to illustrate the identical application of similar poetics, themes, implications in British Romantic poems and Chinese Romantic poems. Therefore, this work tries to bridge the gap by emphasizing these writing techniques applied (i.e. the pathetic fallacy, perspective-taking, and personification) and the topics (e.g. loneliness/solitude, the non-human environment, home, connection, etc) touched upon in the texts.

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Impact of solid waste and reject of industry on the earth environment and its remediation

S.B.Dwivedi, P.B.Ramudu and **R.Shrivas**
Department of Civil Engineering, Indian Institute of Technology, India

Each component of earth is closely related to each other and interchange their elemental constituents. If there is any change happened one component of earth it directly and indirectly effect the other component of the earth environment. Earth Lithosphere has full of various types of solid waste and reject of industry cement industry, health industry, mining industry and construction industry. Generation of industrial wastes in huge quantities has unrepairable impact on earth environment and climate change in for of global warming. Developing country like India require huge amount of landscape for dumping of the waste or rejects of industries. Thus efficient technology is required to recycled and reutilization of billions of metric tons per annum of these waste/rejects. These waste/rejects have been utilized to develop the geopolymers for application in construction industry. Their physical and engineering properties have been estimated to predict their strength and durability. Strength parameter and micr-textures analyses of geopolymers have been analyzed by using X-ray Diffraction, X-ray fluorescence and SEM/EDX to characterize their design of mixture.

Experimental studies have been performed for utilization the waste/reject and industrial waste by-product GGBFS for the production of geopolymers and its engineering parameters evaluation for application as constructional material. The mixtures were prepared by replacing the rejected material with different percentages of GGBFS and activated with alkali concentrations (4, 6, 8 and 10M) of NaOH for preparation of the geopolymer. Unconfined compressive strength has been obtained for all prepared mixtures that are cured at 7, 28 and 56 days either polythene or water curing method. Mineralogical constituents and micro textural performed to know their porosity and permeability.

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Assessment of Heavy metal contents in commercial fishes consumed in Umuahia and their associated human health risks

Simeon Ikechukwu Egba[1], Uroko, Robert Ikechukwu[1] and **Obioma Uzoma Njoku[2]**

[1]Department of Biochemistry, College of Natural Sciences, Michael Okpara University of Agriculture, Nigeria

[2]Department of Biochemistry, Faculty of Biological Sciences, University of Nigeria, Nigeria

This study evaluated the heavy metal contents in commercial fishes consumed in Umuahia, Nigeria and their associated health consequences. Trachurus symmetricus, Clupea pallasii, Micropogonias undulatus, Ictalumus punctatus, Scomber japonicus, Merluccius paradoxus, Pomatomus saltatrix and Oreochromis niloticus were fishes used for the study. The digestion of fish samples, heavy metal analyses and health risk aassessment were carried out using standard methods and models. The heavy metals analyses of the fishes show that chromium was not detected in all the fishes while lead was found to be significantly ($P<0.05$) higher than its permissible limit in all the fishes. With exception of T. symmetricus, M. paradoxus, C. pallasii and S. japonicus that showed detectable levels of Cd, Cu and Co respectively above their permissible limits. Mn and Ni concentrations detected in the fishes were significantly ($P<0.05$) lower than their respective permissible limits. The concentration of Fe detected in most of the fishes was significantly ($P<0.05$) higher than its permissible limit. Daily intakes of heavy metals were below their oral reference daily intake except for I. punctatus with daily intake of Fe above its oral reference daily dose. Target hazard quotients (THQ < 1) were observed in all the fishes except I. punctatus with THQ > 1 for Fe. The hazardous index in I. punctatus, M. paradoxus and P. saltatrix were greater than 1. The carcinogenic risks due to Pb, Cd and Nickel were within the acceptable range of predicted lifetime risks for carcinogens. The total cancer risks of carcinogenic metals in C. pallasii, I. punctatus and M. paradoxus are above the minimum acceptable range of predicted lifetime cancer risk for carcinogens while every other fishes have total cancer risks within the minimum range. The findings of this study show that commercial fishes consumed in Umuahia contain high heavy metals at varying concentrations across fish species with the concentration of same been unsafe for consumption with increased risks of both carcinogenic and non-carcinogenic health risks.

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Identifying rip channels along RK beach, Visakhapatnam using video and satellite imagery analysis

Sivaiah Borra[1] and **S. V. V. Arun Kumar**[2]

[1]*Indian National Centre for Ocean Information Services (INCOIS), India*

[2]*Space Applications Centre (SAC), Indian Space Research Organization (ISRO), India*

Rip currents are one of the most well-known coastal hazards on the world's beaches. Identification and continuous monitoring of these currents are essential for the safety of beachgoers and prevent the number of drowning cases. Studies on the diversity of rip currents in space and time off the Indian coast are minimal. However, these have long been the subject of research worldwide. Based on the earlier rip current-related works in Visakhapatnam beaches, RK Beach is known for highest recorded number of drowning deaths. Albeit, much attention is not given to monitor and safeguard beachgoers from these furious currents. In this work, a preliminary experimental study has been initiated with an objective of continuous monitoring and identification of significant rip channels along Visakhapatnam beaches from video imagery data by adopting and implementing an open-source, Quantitative Coastal Imaging Toolbox (QCIT). Ten minutes of video data were collected from temporarily installed camera for different months. Later, QCIT was used to pre-process the video data, camera calibration, domain definition followed by rectification products. Rectification products contain single image products and pixel instruments. Single-image products such as Timex, and bright and dark images are obtained by calculating the average, maximum, and minimum intensity on the rectified frames, respectively. The phenomenon of persistent gaps in wave-breaking events that appear as dark spots on bright background from Timex images shows quasi-permanent rip channels. The locations of the rip channels extracted from the Timex images were accurately well matched to the hotspot maps of the rip currents obtained from the high-resolution satellite images, drifter and die experiments at the study site. However, once the video camera is permanently set up, further statistical analysis with continuous data availability is also possible. Further implementation of this study would be helpful in the continuous monitoring of coastal rip currents, other coastal parameters (i.e., alongshore currents, shoreline mapping, wave

run-up, and up-to-date nearshore estimated bathymetry), and implementation of numerical modeling of coastal processes by supplying better inputs. With these essential results, ESSO-INCOIS and SAC-ISRO have embarked on a project with the primary objective of continuous monitoring and issuing operational forecasting alerts of rip currents by developing a coastal video surveillance system that also provides information on complex coastal and nearshore processes.

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Renewable integration and energy reduction in multiple stage evaporator

Smitarani Pati
Department of Instrumentation and Control Engineering, Dr. B. R. Ambedkar National Institute of Technology, India

Multiple Stage Evaporator (MSE) is an imperative part of the pulp and paper industry. It is used to process the waste byproduct named Black Liquor (BL) to enhance its solid concentration that may be further utilized to produce biomass based energy. This process accounts very high energy consumption which leads to energy intensiveness of this unit. A substantial amount of energy saving can be achieved by integrating different Energy Reduction Schemes (ERSs) with the MSE. Steam split, feed split, feed preheater, thermo-vapor compressor, etc. are the well-known ERSs that can be incorporated with the MSE to reduce the energy utilization. Hence, this study investigates the hybrid ERSs integrated MSE model to observe its energy efficiency in optimal manner. The prime focus of this work is to maximize the energy efficiency of the MSE unit in teams of maximum steam efficiency which is computed by developing nonlinear mathematical models, obtained by employing the first law of thermodynamics. To achieve the maximized energy efficiency, an optimization function has been developed under constraint environment and solved by using metaheuristic based approach named Flow Direction Algorithm. Another, ERSs named flash tanks can also be integrated with this system to encourage the waste heat re-utilization and ensures an increase in energy efficiency with constant steam consumption. This work also deals with the incorporation of the Linear Fresnel Reflector with ERSs integrated MSE which is capable of reducing the conventional energy load. The overall integrated MSE model achieves an energy efficient and renewably operated MSE unit that may enhance the self-sustainability of the industry.

Decrypting plant-talk

Soami Daya Krishnananda and **Mridul Kumar**
Department of Physics & Computer Science Dayalbagh Educational Institute (Deemed to be University), India

Today Food Security is a global concern. Increased population leading to exponential increase in the demand for food has forced to create methods to minimize food wastage. Agriculture globally suffers 40 % loss due to crop diseases amounting to more than $ 70 billion due to pest infestation (Biotic Plant Stress). United Nations Population Division expects that by 2050, population of world would reach 9.8 billion, 30% more people than today. Reduced use of pesticide due to adverse effect on the health of the consumers has led to increased crop loss in organic farming. Therefore, there is a need in the agri-market to create solutions that can decipher the cross-talk between the plants to understand their well-being, even before plants and crop show visual symptoms of disease. Solutions available today are disease specific and require different techniques for different diseases.

We have developed a technique which decrypts the plant communication to understand their health on a real-time basis. Platform uses cost effective, disposable and plug & play type sensors for forecasting stress in plants. Sensors are not disease specific and can be used on any crop type.

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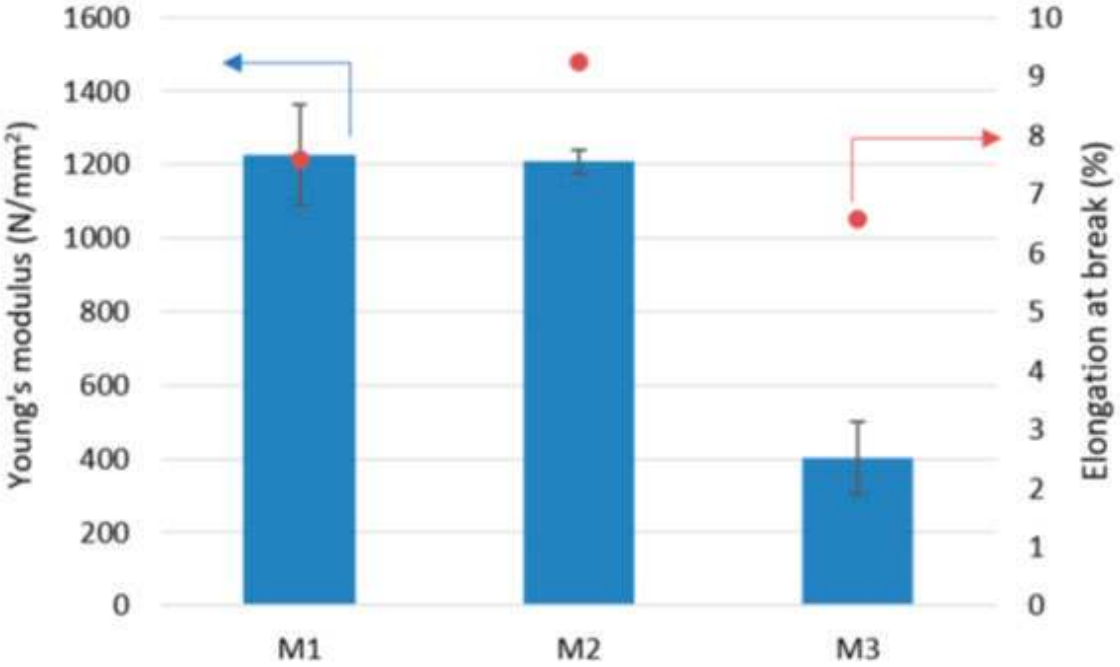
Exploring the effect of iron metal-organic framework particle in polylactic acid membranes for the azeotropic separation of organic/organic mixtures by pervaporation

Sofiane Ben Hamouda[1,6], Asma Msahel[1,2], Francesco Galiano[3], Martina Pilloni[4], Francesca Russo[3], Roberto Castro-Muñoz[5], Guido Ennas[4], Alessandra Scano[4] and **Alberto Figoli[3]**

[1]Laboratory of Water Membrane and Environmental Biotechnology, Tunisia
[2]Department of Chemistry, University of Tunis El-Manar, Tunisia
[3]Institute on Membrane Technology, ITM-CNR, Italy
[4]Chemical and Geological Science Department, University of Cagliari, Italy
[5]Tecnologico de Monterrey, Campus Toluca, Mexico
[6]TEAMSYS Laboratory, CRMN of Technopole of Sousse, Tunisia

A microporous carboxylate metal-organic framework MIL-100 Fe was prepared as submicron particles by microwave-assisted hydrothermal synthesis (Fe-MOF-MW). This product was explored, for the first time, for the preparation of polylactic acid (PLA) mixed matrix membranes. The produced MOF was characterised by powder X-ray diffraction (PXRD), environmental scanning electron microscopy (ESEM) as well as by thermogravimetric analysis (TGA) and nitrogen adsorption/desorption. The effect of different Fe-MOF-MW concentrations (0.1 and 0.5 wt%) on the membrane properties and performance were evaluated. These membranes were used in the pervaporation process for the separation of methanol/methyl tert-butyl-ether mixtures at the azeotropic point. The influence of the feed temperature and vacuum pressure on the membrane performance was evaluated and the results were compared with PLA pristine membranes. Moreover, the produced membranes have been characterised in terms of morphology, MOF dispersion in the polymeric membrane matrix, wettability, thickness, mechanical resistance and swelling propensity. The presence of Fe-MOF-MW was found to have a beneficial effect in improving the selectivity of mixed matrix membranes towards methanol at both concentrations. The highest selectivity was obtained for the PLA membranes embedded with 0.5 wt% of Fe-MOF-MW and tested at the temperature of 25°C and vacuum pressure of 0.09 mbar.



Young's modulus and elongation at break of investigated membranes.

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Energy saving in non-centrifugal sugar production

P. Sreedevi[1], P.V.K. JagannadhaRao[1] and **M. Subash Sundar[2]**
[1]*Regional Agricultural Research Station, India*
[2]*Polytechnic of Agricultural Engineering, India*

Non-centrifugal sugar, commonly known as Jaggery is a traditional nutritional sweetener obtained by evaporation of sugarcane juice. The sequential unit operations in jaggery processing include cleaning, crushing, boiling, cooling, moulding, drying and packing. Out of these, much energy was utilized for boiling operation. The efficiencies of jaggery plant are very low due to the use of age-old constructed furnaces and non-adoption of advanced technologies (Sharon et al., 2013). The present study focuses on upgrading of jaggery plants through introduction of improved furnaces thereby saving and energy. Hence the study was conducted with an objective to compare performance evaluation of traditional single pan furnace, improved single pan furnace and three pan furnaces in terms of saving in fuel and time. The results revealed that there is saving of 26% of fuel in improved single pan system and 43% saving in three pan furnace for boiling 1 tonne of sugarcane juice compared to traditional single pan furnace system which are similar to the results obtained by Shiralkar et al. (2013). Also, there is saving of 13% in time in improved furnace system and 56% in 3 pan furnace system compared to traditional furnace system. Hence, the three-pan furnace system can be recommended for jaggery entrepreneurs which not only saves energy and time and increases production capacity by 100%.

Table1. *Performance of traditional, improved single pan furnace with three pan furnace.*

S.No.	Parameter	Traditional single pan furnace	Improved single pan furnace	3 Pan furnace
1	Weight of cane, kg	1000	1000	3000
2	Weight of juice, kg	530	520	1710
3	Fuel used (kg)	500	370	849
4	Time taken (min)	180	155	234
5	Weight of jaggery produced, kg	105	103	330
6	Saving in Fuel (%)	-	26	43
7	Saving in Time (%)	-	13	56

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Biomonitoring and dietary intake of pesticide exposure: An insight over different sex and socio-economic observation on children

Sukesh Narayan Sinha
Scientist-F, Food Safety Division, National Institute of Nutrition, India

The biomonitoring of urine dialkyl phosphate metabolites was used to determine the level of pesticide exposure in children exposed to organophosphorus pesticides. There are very limited studies evaluating pesticide exposure in teenagers of either sex. The major goal was to create a modelling strategy for determining metabolite concentrations that were based on a combination of exposure and dosage. As an additional goal, we were trying to see whether pesticide exposure among teenagers of various genders had changed significantly. In order to maintain children's urine metabolites levels below specified values, we used a coupled exposure-dose modelling technique to calculate the concentrations of metabolites that would keep children's urine metabolites levels below a certain threshold. We collected urine samples from 377 children ages 6–10 and 11–15 from Hyderabad, India, including 188 males and 189 girls. First-morning first urine samples (3.05 µmol L-1) were closely linked with the same-day 24-hr samples (1.7 µmol L-1) with 99.4 percent accuracy ($r = 0.997$, model $R2 \approx 0.994$, $p < 0.00$), according to the findings. Girls had an 87.5 % detection rate of DAP metabolites, compared to a 74% detection rate for DAP metabolites among boys, regardless of the quantity of traditional food consumed. Pesticide metabolite levels were significantly greater in the female group (87% higher) than in the male group.

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Non-adoption decision of biogas in rural Pakistan: Use of multinomial logit model

Sultan Adeel[2], Iram Yasmin[1], Waqar Akram[2] and **Abbas Ali Chandio[3]**

[1]Department of Economics, Government College Women University, Pakistan
[2]Department of Business Administration, Sukkur IBA University, Pakistan
[3]College of Economics, Sichuan Agricultural University, China

In 2009, Pakistan introduced a subsidized biogas program to disseminate clean and affordable energy in rural areas. However, the adoption rate did not appear as expected. Therefore, the present study aims to examine the determinants behind the non-adoption of biogas digesters. Detailed information via a structured questionnaire was obtained from biogas adopters and non-adopters, and analyses were performed in two levels. Initially, the study used the multinomial logit regression to elicit the non-adoption behavior. Results depicted family size, risk aversion, cook education (women), kitchen (inside the home), home structure, and non-availability of inputs as significant factors behind non-adoption. Detailed analysis also revealed that the factors like the age of the household head, area of the house, cook education (women), location of the kitchen (inside the home), and the distance of the house to the bus stop (minutes) lead towards the potential adoption of biogas. The study also investigated the potential factors behind the long-term sustainability of biogas digesters with the help of binary logit. The results depicted that the kitchen's location (inside the house), cook education (women), training, and subsidy significantly and positively impact the biogas plant's probability of being functional. Based on these results, the study suggested that policymakers increase women's education in rural areas, provide a subsidy to reduce costs and risk, and arrange training for adopters.

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Anatomy of intracratonic Gondwana rift basins of Peninsular India: An integrated gravity, magnetic and remote sensing approach

Swarnapriya Chowdari
CSIR-NGRI (National Geophysical Research Institute), India

The Gondwana rift basins of Peninsular India are situated close and parallel to the junctions in the suture zones between the Archean cratons such as Dharwar, Bastar, and Singbhum. There are four Gondwana rift basins of India represented by the E-W trending Damodar and Satpura Basins and NW-SE trending Son-Mahanadi and Pranhita-Godavari Basins. A combined analysis of gravity, magnetic, and Remote Sensing techniques to delineate the subsurface structures to tracing the tectonic evolution of the basin. Landsat Remote sensing data, ground gravity, and Emag2 magnetic data were used to understand the surface and subsurface structures.

The Bouguer gravity anomaly map of the Gondwana basins of India and its adjoining area depicts prominent linear gravity low of the order of 50mGal negative anomalies due to lower density Gondwana sediments. It shows a total anomaly variation of 148 mGal with a relative gravity low of 111 mGal and a high of 37 mGal. The EMAG2 magnetic anomaly map of the study area shows a variation of about 1773 nT with a low of -795 nT and a high of 978 nT. Landsat 8 Operational Land Imager (OLI) and Thermal Infrared sensor (TIRS) C2 Level 1 Data of 30m resolution used for integration purpose.

The major structural trends show NNW–SSE from Pranhita-Godavari basin, ENE-WSW, and NW-SE from Son-Mahanadi basin, NE–SW from Satpura basin and it appears the different basins of the Damodar valley along with an E–W trending structures characterized by NW–SE Karanpura–Bokaro, NW–SE to NNE–SSW Jharia basin, NNW–SSE, and NNE–SSW Ranigunj basin.

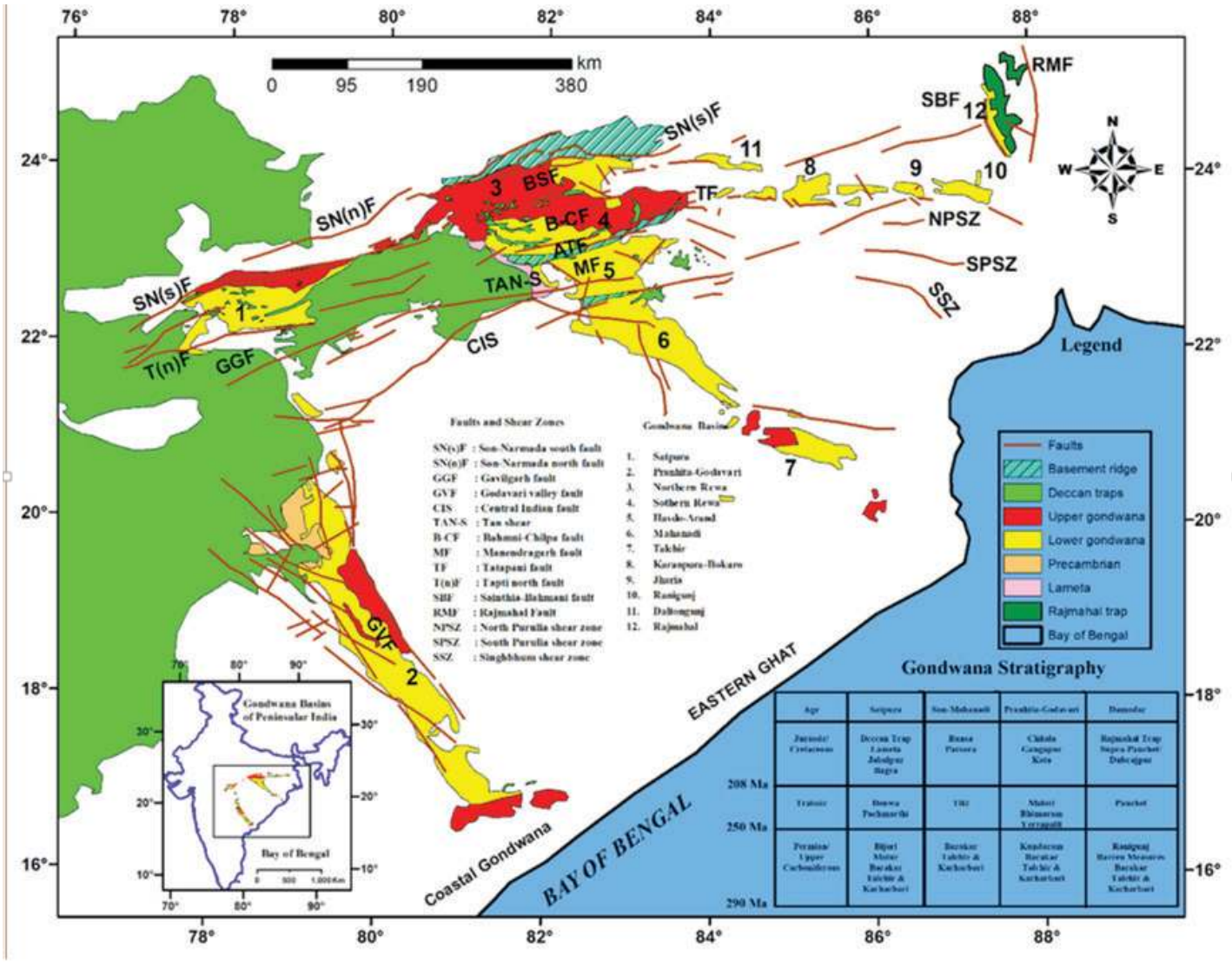

Fig: *Upper and lower Gondwana rift basins, basin belts & sub basins and major faults in the Indian peninsula.*

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Evaluation of corrosivity and scaling properties of groundwater of central Gujarat for industrial usage

Swayam Siddha and **Paulami Sahu**
School of Environment and Sustainable Development, Central University of Gujarat, India

The Central Gujarat is a sub-urban and industrialized region. Here, groundwater has been chiefly employed for industrial utilities. Hence, there has been much requirement to evaluate the groundwater quality in terms of corrosivity as well as scaling. Seven indices such as corrosivity ratio (CR), Langelier Saturation Index (LSI), Ryznar Stability Index (RSI), Puckorius Scaling Index (PSI), Larson-Skold index (LS), Revelle Index (RI) and Chloride Sulfate Mass Ratio (CSMR) have been applied to estimate the groundwater stability for industrial purpose. The CR and RSI values indicate that the groundwater in 98.58% and 51% respectively of total area is unsuitable for industrial purposes. The LSI and PSI values reveal that the groundwater in 97.87% and 56.2% respectively of total area can cause scaling in plumbing equipment. According to LS index, highly corrosive groundwater is found in 82.76% of the total area. Again, RI values display that groundwater of 97.67% of total area has been marginally affected by salinity. All the groundwaters with CSMR values >0.5 indicate to promote galvanic corrosion in water distribution network. Nevertheless, majority of the manifestations disclose that groundwater of VRB region is unsuitable for industrial applications. Maintenance of pipe lines in the water distribution network, corrosion and scaling prevention techniques, regular groundwater quality assessment should be carried out for the management of groundwater quality. However, this study is necessary for decision makers and policy makers to strengthen the sustainable management of groundwater resources. Similar kind of assessment can be simulated everywhere on the earth to assess groundwater qualitatively for industrial utilization.

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Determinants of use of solar energy as alternative source of power by small and medium enterprises in Lagos state, Nigeria

Sylvester Anani Anaba and **Olusanya Elisa Olubusoye**
University of Ibadan, Nigeria

Small and Medium Enterprises (SMEs) in Lagos State (Lagos) suffer from frequent power outages from the national grid resulting in financial losses, and eventual shut down. The use of alternative sources of power to alleviate the impact of power outages by SMEs on their businesses is rampant. Extant literatures showed that solar energy is one of the alternative sources of energy used by SMEs to mitigate the effect of frequent power outages. Literature is sparse on the level of penetration/use of solar energy by SMEs, and the determinants of use of solar energy as an alternative source of power by SMEs. Therefore, this study was aimed at assessing the level of penetration/use of solar energy, and identify the determinants of use of solar energy by SMEs in Lagos.

The research which was hinged on consumers' theory, was a quantitative research using econometric techniques like descriptive statistics, perceptual maps, and binary logistic regression. Questionnaires were randomly distributed to six hundred SMEs in the urban, semi urban, and rural areas of Lagos. Data were presented in tables, graphs, and charts.

The study showed 88% level of penetration, and a 77% level of use of solar energy by SMEs in Lagos. The perceptual maps of the study indicated that, the level of penetration/use of solar energy amongst SMEs in Lagos is high. Similarly, binary logistic regression showed that, general cost of power from the DisCos, and policy support for solar energy were more likely to be the determinants of use of solar energy as an alternative source of power by SMEs in Lagos.

It was concluded that general cost of power from the DisCos, and policy support for solar energy were the determinants of use of solar energy as an alternative source of power by SMEs at the time of the research.

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Impact of climate change on cryosphere and streamflow in the north-western Himalayan region

Tanveer Dar[1], Nachiketa Rai[1], Sudhir Kumar[2] and **Mohd Aadil Bhat[3]**

[1]Department of Earth Sciences, Indian Institute of Technology, India

[2]Hydrological Investigations Division, National Institute of Hydrology, India

[3]Institute of Surface-Earth System Science, School of Earth System Science, Tianjin University, China

The climate of the Himalayas is vulnerable and interlinked with global-scale climate changes, and the hydrology of the region mainly depends on the cryosphere. This is the first study that has created glacier and glacier lake inventory that links the impact of cryosphere on streamflow to land system dynamic changes under the changing climate of the Upper Jhelum River Basin (UJRB) of the Kashmir Himalayan region. This study uses a series of satellite data (1980–2016) to assess the depletion of Snow Cover Area (SCA), deglaciation, and dynamics of glacial lakes. The results suggested an overall rise in temperature (TMax=0.05ºC a-1; TMin=0.02ºC a-1; Tavg=0.06ºC a-1) and a decrease in precipitation (2.9 mm a-1) between 1980 and 2016 with a significant increase in annual average temperature and decrease in annual precipitation at stations located at higher altitudes. The Snow Cover Area (SCA) showed a significantly decreasing ($p<0.01$) trend in the glacierized sub-basins. The findings of this study reveal the high occurrence of glacier disintegration and deglaciation. During the period 2010-2016, a rapid rate of deglaciation was observed (18.34±0.14 km2), followed by 1992-2000 (15.61±0.13 km2). The average rate of retreat was observed to be 6.81± 1.5m a−1 with a total retreat of 267±80m during 1980-2016, which is higher than reported from surrounding mountain ranges in the Himalayas. The mapped 244 glacial and high-altitude lake inventory covers a total surface area of around 15 km2, with 5.87 km2 (40%) covered by 25 bedrock dammed lakes. The annual average discharge in UJRB significantly increased from 1991 to 1998 and was observed to be higher than the annual average of the respected gauge stations but shows significant depletion from 1998 onwards. The streamflow depletion under climate change is one of the reasons for land system dynamics in UJRB.

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Current research and challenges in AI based proctoring system

Prathamesh Churi
Mukesh Patel School of Technology Management & Engineering, NMIMS University, India

Online proctoring services are also on the rise, and AI-based proctoring systems (henceforth called as AIPS) have taken the market by storm. Online proctoring systems (henceforth called as OPS), in general, makes use of online tools to maintain the sanctity of the examination. While most of this software uses various modules, the sensitive information they collect raises concerns among the student community. There are various psychological, cultural and technological parameters need to be considered while developing AIPS. This paper systematically reviews existing AI and non-AI-based proctoring systems. Through the systematic search on Scopus, Web of Science and ERIC repositories, 43 paper were listed out from the year 2015 to 2021. We addressed 4 primary research questions which were focusing on existing architecture of AIPS, Parameters to be considered for AIPS, trends and Issues in AIPS and Future of AIPS. Our 360-degree analysis on OPS and AIPS reveals that security issues associated with AIPS are multiplying and are a cause of legitimate concern. Major issues include Security and Privacy concerns, ethical concerns, Trust in AI-based technology, lack of training among usage of technology, cost and many more. The most reasonable conclusion we can reach in the present is that the ethical justification of these technologies and their various capabilities requires us to rigorously ensure that a balance is struck between the concerns with the possible benefits to the best of our abilities. Our work further addresses the issues in AIPS in human and technological aspect. It also lists out key points and new technologies that have only recently been introduced but could significantly impact online education and OPS in the years to come.

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Geoinformatics-based applications for estimation of green energy potential as a sustainable energy source: Emphasis on climate resilient cities

Tariq Sardar
Department of Environmental Sciences, Kohat University of Science & Technology, Pakistan

Climate resilient cities will be objectively developed for a sustainable and environmental-friendly life against unprecedented impacts of the climate change. The present study is focused on the determination of green energy potential to develop climate-smart cities based on suitability and useable aspect of natural energy as a sustainable energy source. These renewable energy sources are determined through spatial-based potential by following the integrative approach of Geographic Information System (GIS) and remote sensing application as an applicable tool of geoinformatics for real-time visualization towards climate-smart and applicable decision making for urban development. Hence, these properties make geoinformatics a viable approach in the applications of green energy estimation for the development of climate resilient cities. Prospectively, this integrative based applications of geoinformatics with the additional consideration of related critical parameters can be a reliable approach for application in the determination of reliable and sustainable urban places for exploring the potential of these natural and sustainable sources of energy.

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Impact of climate variability on rain-fed maize and sorghum yield among smallholder farmers

Teka Bekuma[1], Girma Mamo[2] and **Alemayehu Regassa[3]**

[1]*PhD Student, Jimma University, Ethiopia*

[2]*PhD, Ethiopian Institute of Agricultural Research, Ethiopia*

[3]*PhD, Jimma University, Ethiopia*

Rain-fed food crop production is very sensitive to climate variability. The majority of Ethiopian population is reliant on rain-fed seasonal agriculture, which is the backbone of the country's economy. The objective of the study was to investigate the impact of rainfall and temperature changes on maize and sorghum yields. The data were analyzed using the Mann–Kendall trend test, Sen's slope, correlation, and regression models. The study's findings demonstrated that rainfall and temperature have different effects on maize and sorghum yields. The Mann-Kendall trend test has detected the presence of a significant increasing trend for both maize and sorghum yields. Though there was an upward trend, the result also suggests that maize and sorghum yields have been fluctuating more. There was a variation of 90% and 88% in maize and sorghum yield, respectively. The R-squared statistics indicated the variability of 25.21%, 1.12%, and 20.39% in maize yield was explained by its growing period rainfall, minimum, and maximum temperature respectively. Growing period rainfall and minimum temperature were positively correlated with maize and sorghum yield output, while the maximum temperature was negatively correlated. A significant association has been detected between sorghum yield and its growing period rainfall and maximum temperature. The regression model revealed that rainfall, minimum, and maximum temperatures explained 46.81%, 5.08% and 30.18% of the variation in sorghum production, respectively. Both crops showed unpredictability as a result of rainfall and temperature changes, emphasizing the necessity for irrigated agriculture, agricultural diversification, and livelihood diversification to respond to climate variability.

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Beekeeping in the face of climate change in Ada Berga District, Oromia, Ethiopia

Teshome Kassa Degu[1,2]

[1]*Jimma University College of Agriculture and Veterinary Medicine, Rural Development, Ethiopia*
[2]*Holeta Bee Research Centre, Oromia Special Zone Surrounding Finfine, Ethiopia*

Beekeeping contributes to income generation. The honey is also consumed at home and used for medicine. Climate change and environmental degradation threaten beekeeping. Quantitative data on climatic effects and responses collected using semi-structured interviews and qualitative data from focus groups and key informants were analyzed using descriptive and inferential statistics and content analysis, respectively. Respondents reported reduced honey production, colonies absconding, reduced pollen and nectar forage, reduced occupation rate of swarm and reduced comb experienced in their locality. Respondents attributed these to climate change or variability; one-third of respondents experienced all of these. There was a statistically significant difference among agro-ecologies to the combined effects imposed by rainfall, temperature and drought. Information on the influence of climate variability should help to design and implement intervention to improve productivity and livelihoods.

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Determinants of a mobile phone-based Interactive Voice Response (mIVR) system for monitoring childhood illnesses in a rural district of Ghana: Empirical evidence from the UTAUT model

T. K. Adjei[1,2], A. Mohammed[3], P. R. Acheampong[1], E. Acquah-Gyan[1], A. Sylverken[4,5], S. Twumasi-Ankrah[6], M. Owusu[7] and **E. Owusu-Dabo[1]**

[1]Department of Global and International Health, School of Public Health- Kwame Nkrumah University of Science and Technology, Ghana

[2]Department of Obstetrics and Gynaecology, Komfo Anokye Teaching Hospital, Ghana

[3]Department of Epidemiology and Biostatistics, School of Public Health- Kwame Nkrumah University of Science and Technology, Ghana

[4]Department of Theoretical and Applied Biology, College of Science, Kwame Nkrumah University of Science and Technology, Ghana

[5]Kumasi Centre for Collaborative Research in Tropical Medicine, Ghana

[6]Department of Statistics and Actuarial Science, College of Science, Kwame Nkrumah University of Science and Technology, Ghana

[7]Department of Medical Diagnostics, Faculty of Allied Health, Kwame Nkrumah University of Science and Technology, Ghana

Background: The use of a mobile phone-based Interactive Voice Response (mIVR) System for real time monitoring of childhood illnesses provides an opportunity to improve childhood survival and health systems. However, little is known about the factors that facilitate its use. This study sought to identify key determinants and moderators of mIVR system use among caregivers in a rural district of Ghana using the Unified Theory of Acceptance and Use of Technology (UTAUT) model.

Methods: The mIVR system was designed to provide real-time data on common symptoms of childhood illnesses after answering several questions by caregivers with sick children. A structured questionnaire was used to collect data from 354 caregivers of children under-five living in rural communities, four (4) months after introducing the system. Regression analysis was used to identify key determinants and moderating factors that facilitate the use of the system, based on the UTAUT model.

Results: Total of 101 (28.5%) caregivers had used the system and 328 (92.7%) had intention to use it. Caregivers' level of education and household wealth were associated with use of the mIVR systems ($p<0.001$). Behavioural intention (BI) to use mIVR system was positively influenced by performance expectancy (PE) ($\beta = 0.278$, 95% CI: 0.207, 0.349), effort expectancy (EE) ($\beta = 0.242$, 95% CI: 0.159, 0.326) and social influence (SI) ($\beta= 0.081$, 95% CI: 0.044, 0.120). Facilitating conditions (FC) ($\beta = 0.609$, 95% CI: 0.502, 0.715) and behavioural intention ($\beta = 0.426$, 95% CI: 0.255, 0.597) had a positive influence on user behaviour (UB). Mobile phone experience and household wealth significantly moderated the effect of PE, EE, SI, and FC on behavioural intention and usage of mIVR system.

Conclusion: The perceived usefulness of the mIVR system, ease of use, social influences, and facilitating conditions are key determinants of users' attitude and use of mIVR system. These relationships are significantly moderated by users' phone experience and wealth status.

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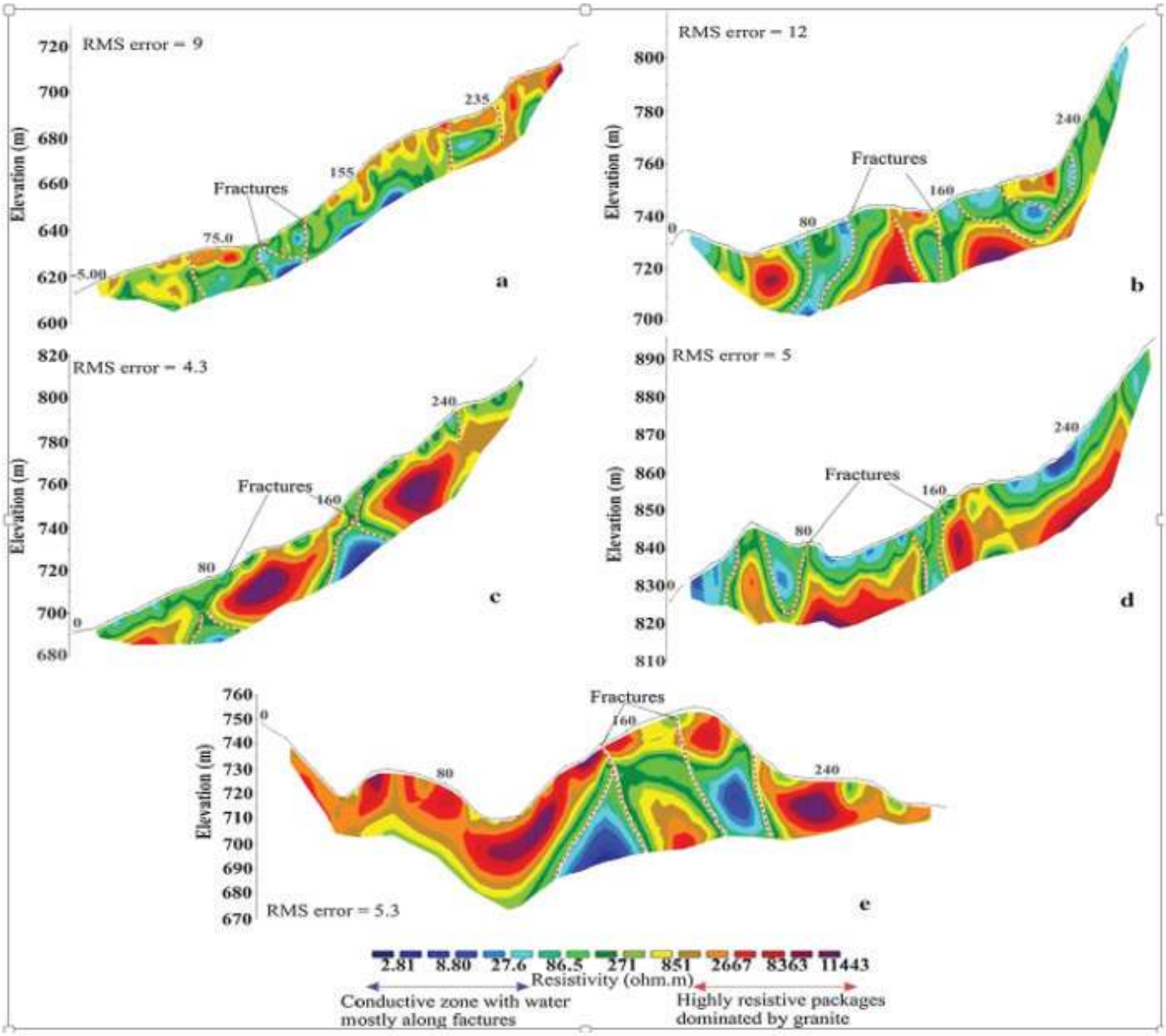
Electrical resistivity tomography for delineating groundwater potential zones in fractured metasedimentary rocks, lesser Himalayas, Pakistan

Umair Bin Nisar[1] and **Muhammad Farooq**[2]

[1]*Centre for Climate Research and Development (CCRD), COMSATS University Islamabad, Pakistan*
[2]*Institute of Geology, University of Azad Jammu and Kashmir, Pakistan*

Geological discontinuities such as faults and fractures occur in all kinds of rock terrains. Investigation of these discontinuities is important in understanding the geological structures and their potential for groundwater accumulation. In the present study, the surface geology, electrical resistivity tomography technique and borehole datasets were integrated to delineate fracture zones in meta-sedimentary rocks of Malakand area, northern Pakistan. Six electrical resistivity tomography (ERT) profiles were acquired using multi-electrode imaging system by adopting Wenner–Schlumberger electrode configuration having 5 m electrode spacing attaining a maximum spread length of 300 m. Three dominant zones of variable resistivity were identified, i.e., the top layer mostly comprised of dry surficial deposit (clay, silt and sand) followed by deformed meta-sediments until bedrock is achieved. The results revealed highly fractured and low resistivity zones surrounding the bedrock of Saidu Formation and Malakand granite. The identified buried fracture zones were associated with east–west trending thrust patterns (controlled by local tectonics). These fractures serve as zones for potential groundwater accumulation/recharge and provide sustainable water resources for the local community. Furthermore, 2D electrical resistivity tomograms have also provided an insight into structural complexity, dipping towards north and south bounding local reservoirs. The techniques used in this study could be opted for other adjacent regions with similar subsurface geological conditions to demarcate the groundwater potential zones.


RMS error = 9
Fractures
75.0
155
235
-5.00
a
RMS error = 12
Fractures
80
160
240
0
b
RMS error = 4.3
Fractures
80
160
240
0
c
RMS error = 5
Fractures
80
160
240
0
d
Fractures
80
160
240
0
RMS error = 5.3
e
Elevation (m)
2.81 8.80 27.6 86.5 271 851 2667 8363 11443
Resistivity (ohm.m)
Conductive zone with water mostly along factures
Highly resistive packages dominated by granite

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Urbanization, informal economy, and ecological footprint quality in South Asia

Unbreen Qayyum[1], Samina Sabir[2] and **Sohail Anjum[3]**
[1]*Pakistan Institute of Development Economics, Pakistan*
[2]*University of Azad Jammu & Kashmir, Pakistan*
[3]*The University of Lahore, Pakistan*

In recent years, South Asian economies have observed rapid urbanization along with expanding informal economy that poses a serious threat to environmental quality. This study examines the impact of urbanization and informal economy on the ecological footprint of selected South Asian countries. Results indicate that urbanization and informal economy increase the environmental degradation in South Asia and the estimates are statistically significant in the long run. In the short run, urbanization positively affects the ecological footprint in Bangladesh, Pakistan, Sri Lanka, and Nepal except India, while the informal economy also enhances environmental degradation for all the selected countries except Bangladesh. Most surprisingly, the interaction term of urbanization and informal economy has a negative impact on ecological footprint, and the coefficient is statistically significant as well. To combat the environmental issues in South Asia, detailed policy recommendations have been suggested at the end.

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Genetic diversity in natural population of Notopterus evaluated through mitochondrial DNA marker ATPase 6/8 regions and cytochrome b gene

W. Ahmad and **M. Naeem**

Zoology Division, Institute of Pure and Applied Biology, Bahauddin Zakariya University Multan, Pakistan

Objective: Population structure and genetic diversity of bronze featherback Notopterus notopterus, fish was not studied yet from Pakistan.

We evaluated the pattern of genetic diversity and demographic history of N. notopterus from five largest rivers of Pakistan using ATPase 6/8 and Cytb genes.

Scope: Study of genetic diversity study is important because it gives species a better chance of survival. The information of genetic diversity and genetic variation, from this research can be utilized to help in conservation and management the species in the wild having less genetic stock.

Methods and results: 150 specimens were collected from five rivers of Pakistan, resulting 56 haplotypes were detected for ATPase 6/8, Cytb and concatenated gene. Haplotype and nucleotide diversity for ATPase 6/8, Cytb and concatenated gene was observed below 1% among five natural populations of N. notopterus. ATPase 6/8 and Cytb genetic variance among populations was 6% and among and within individuals was 94%. Fst value among all population was found 0.091 (p-value =0.02, $p<0.05$). The combined data set mean coefficient of genetic differentiation (FST) was 0.5572. Maximum likelihood phylogeographic history provided four distinct diversified clusters. AMOVA, PCoA and maximum likelihood tree indicated that the N. notopterus comprised of four genetic stocks among five Pakistani rivers (Chenab, Indus, Jehlum, Ravi and Satluj).

Conclusions: This study provides the higher level of genetic diversity with confirmatory proofs among genetic stocks of five natural populations of N. notopterus.

Among five rivers, River Jehlum, Ravi and Satluj have highest genetic diversity while River Indus and Chenab indicated low genetic diversity of N. notopterus. So, in this context, the populations of Indus River and Chenab River are needed to be conserved, and the suitable measures must be adopted by the resource managers. This may be attained through unified approaches of policy makers with researchers and stakeholders.

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Agricultural decision system based on advanced machine learning models for yield prediction: Case of East African countries

R. Awork[1], W. Y. H. Adoni[2], L. Saadio Cedric[1], F.K Mutombo[3], J. T. Zoueu[4], C. L. M. Kimpolo[1], T. Nahhal[5] and **M. Krichen[6]**

[1]African Institute for Mathematical Sciences, Senegal - Ghana – Rwanda
[2]International University of Casablanca, Morocco
[3]University of Lubumbashi, Democratic Republic of Congo
[4]University of San Pedro, Côte d'Ivoire
[5]Hassan II University of Casablanca, Morocco
[6]Albaha University, Saudi Arabia

Food security has become a real challenge for some organizations in charge of the food program and for the majority of countries, especially African countries. The United Nations Organizations' has recently defined the end of hunger and the improvement of food security in 2030 as its primary goal. Improving food security could also pass through the handling of agricultural yield. Agricultural yield is affected by climate changes since this latest decade. Climate change is considered one of the major threats to agricultural development in Africa. Decision-making level and farmers need efficient analytical tools to help them in decision making. Machine learning has become an impressive predictive analytical tool for large volume of data. It has been used in many domains such as medicine, finance, sport, and recently in agriculture. In this work, we propose three crop prediction models : Crop Random Forest, Crop Gradient Boosting Machine and Crop Support Vector Machine. We combine climate data, crop production data, and pesticides data to develop a decision system based on advanced machine learning models. Despite the poor availability of data related to agriculture in Africa, we were able to propose a decision system able to predict the crop yield at the country level in fourteen East African countries. Our experimental results show that the three proposed machine learning models fit well the crop data with a high accuracy R2. The Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) associated to our models are very minimal because the agricultural prediction values are very close to reality. Our proposed models are reliable and generalize well the agricultural predictions in East Africa.

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A framework for systemic sustainable construction industry development

W. Gyadu-Asiedu, A. Ampadu-Asiamah and **A. Fokuo-Kusi**
[1]*Koforidua Technical University, Ghana*
[2]*Accra Technical University, Ghana*
[3]*Sunyani Technical University, Ghana*

The Construction industry (CI) development has been a global agendum for several countries. Moreover, the launch of Agenda 21 brought a new dimension to the quest. Together, these pursuits have not achieved much due to many challenges in implementation. These challenges include project execution challenges, sustainable construction modelling challenges, and CI development structuring challenges. The study aimed to provide a framework for structuring the construction industry development agenda with a more rigorous approach. To achieve this means looking at all the relevant issues of development and sustainability within the industry holistically and designing them into a system that promotes its development and monitoring. The study adopted the qualitative approach within the constructivist epistemological paradigm. It used the integrative literature review approach to elucidate its nature and proper systemic context of the construction industry. Common challenges inherent in all CIs are complexity, interconnectedness, fragmentation, culture, and informality, while the following concepts and principles underpin the development of the CI : (1) the concept of the CI as a system of systems (using the principles of systems thinking and systems engineering), (2) Sustainable development concepts considered within the sustainable development goals (SDGs) and specified in the triple-bottom-line (TBL), i.e., the economic, environmental, and the social dimensions, (3) the components of CI development: technology, corporate, human resource, institutional, material, documentation, practice and procedure, and operating environment, (4) Integrated studies. All of these formed the basis for modelling a conceptual framework which became the basis for the development of a systemic framework for (1) structuring the CI development agenda within the sustainable development concepts and (2) assessing the maturity levels for the stage-by-stage development of a CI, thereby monitoring its performance and growth.

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Life cycle assessment of marble industry for cleaner production technology as a pollution prevention measure

Wisal Shah and **Muhammad Fawad**
Department of Environmental Sciences, The University of Haripur, Pakistan

Marble Processing Industry is considered in the category of environmentally unfriendly industry since they produce enormous quantities of wastewater, stone slurries, scrap, and powder wastes. The objective of this study was to evaluate the entire process based on Life Cycle Assessment (LCA) according to ISO 14040-44 methodological framework and quantify the impact in terms of resource consumption, water, energy, and on the environment; and to identify hotspots for cleaner production potential. Material Inputs and outputs are based on 1 tonne finished product as a functional unit were determined using Life Cycle Inventory. The results of life cycle inventory were statistically analyzed using Sankey Matic beta and SimaPro LCA software. It was estimated that 1-tonne marble tiles production requires 0.028MWh electricity, 1.25 tonne (1250 kg) of quarried marble stone, and 0.75 m^3 (750 L) of cooling water. Approximately, 0.25 tonne (250kg) of marble stone gets wasted in the form of scrap stone and marble powder, 97 % of the cooling water inputs leave the processing facilities as wastewater and the remaining 03% leave the processing facility as evaporation and moisture per unit tonne of the finished product. Using LCA analysis data sets the study identified three hotspots of waste produced during marble processing in MPU. These included marble scrap waste, marble powder, and wastewater. The study recommends that marble scrap shall be properly marketed for onward use because 98% of marble waste is composed of $CaCO_3$; Wastewater shall be recycled and reused to avoid water pollution. It is recommended that the current LCA dataset of the marble production chain should be extended to other production scenarios and alternative technological options like process modification for cleaner production technology.

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Analysis of PV fed BLDC motor using PSO and TLBO algorithm

A.Wisemin Lins
Vels Institute of Science Technology and Advanced Studies, India

Solar is considered to be an important source of renewable energy which is preferred in various applications. Because of the nonlinear characteristics of the solar PV source, it is required to find higher peak power (MPPT- Maximum power point tracker) at any instant, maximize system efficiency and minimize the ROI (return of investment) on the solar PV installation. This work presents the design and analysis of solar fed BLDC drive with various mppt techniques. The system has a PV panel, MPPT controller, Charge controller, battery backup, voltage source inverter and a BLDC motor. A zeta converter is used to extract the maximum available power from the PV system. Due to the fluctuating input voltage a ZETA converter is used to provide a constant output voltage which is controlled proficiently by using MPPT algorithm. The MPPT controller is used to draw optimum power from the PV panel. The MPPT controller uses the optimization algorithms such as Particle swarm optimization and Teaching Learning Based Optimization Algorithm to harvest the maximum power from the PV panel.

Since the solar energy is irregular in nature, a battery needs to be connected in parallel to the system. When the solar energy is available, the solar energy charges the battery, runs the BLDC motor as well. When the solar energy is not available the battery discharges through the bidirectional buck converter which in turn runs the electric motor. The output of the ZETA converter is fed to the BLDC motor through a voltage source inverter. The switching of voltage source inverter's (VSI) is controlled by the PI controller for the speed control of BLDC motor.

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Hyperspectral endmember extraction based on convex geometry

Dharam Shah and **Y. N. Trivedi**
Institute of Technology, Nirma University, India

The decomposition of the mixed pixels into individual pure material (endmember) along with its proposition is called spectral unmixing for hyperspectral images. Spectral unmixing is considered a three-stage problem (as shown in Figure 1) for the hyperspectral image. The first is the subspace dimension which finds the number of pure materials in the image. The second one is endmember extraction which extracts the pure material spectra from the image and the third one is abundance estimation which estimates the proportions of each material in mixing. The endmember extraction is a very challenging stage in spectral unmixing as abundance mapping greatly depends on extracted endmembers. In the literature, endmember extraction is addressed using a geometrical, statistical, sparse regression, and deep learning approach. Due to simplicity and easy understanding, many researchers use the geometrical approach. We will discuss our three novel algorithms: Entropy-based convex set optimization (ECSO), Convex Geometry and K-medoids based Noise Robust (CGKNR), Convex polygon maximization (CPM). All the extracted endmembers of the three novel algorithms have been compared with the extracted endmembers of the prevailing algorithms on benchmark real and synthetic datasets using standard evaluation parameters such as Spectral Angle Mapper (SAM), Spectral Information Divergence (SID), and Normalized cross-Correlation (NXC). The Root Mean Square Error (RMSE) is used to test the efficacy of the extracted endmember for abundance mapping. The RMSE error is calculated between FCLS based abundance maps by the endmember of the proposed algorithm and FCLS based abundance maps by the Ground Truth. We have used the Hyperspectral Imagery Synthesis Toolbox (HIST) for generating five types of synthetic images. The synthetic images are added with Gaussian noise to test the noise robustness. The proposed algorithms in this thesis can be used for a variety of hyperspectral applications, including classification, target detection, and many others. Table 1 compares the three novel endmember extraction algorithms.

Table 1: *Comparison of three novel endmember extraction algorithms*

No	Algorithm	RMS of SAM	Time (in sec)	Efficiency
1	ECSO	7.68	66.97	1.94
2	CGKNR	16.97	0.90	65.73
3	CPM	7.25	26.41	5.22

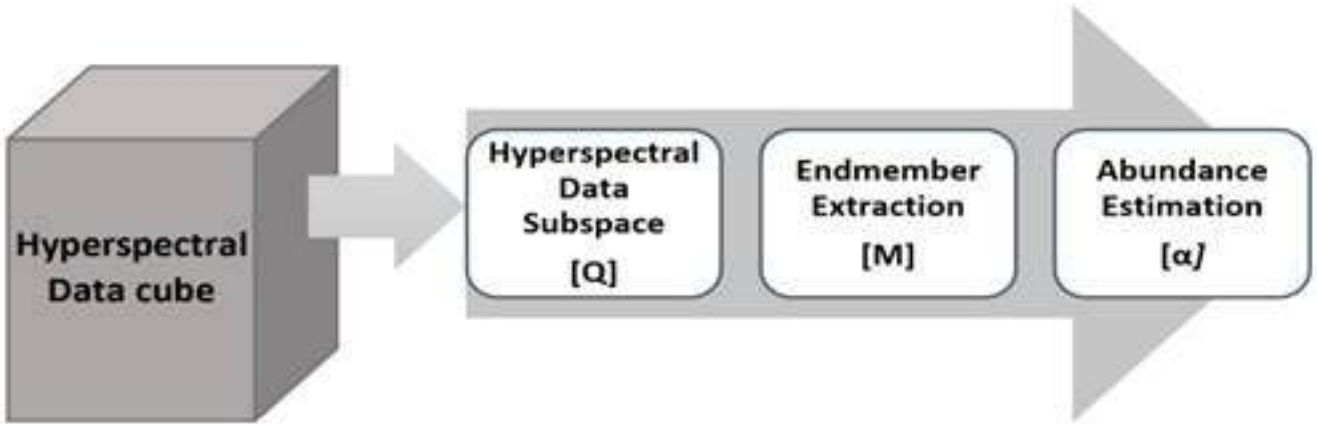

Figure 1: *Hyperspectral unmixing chain*

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A meta-analysis on the effect of agricultural extension on farmers' market participation in Ethiopia

Yohannes Girma
Injibara University, Ethiopia

Agriculture is the backbone of Ethiopian economy. Majority of the farmers produce agricultural product for their own home consumption and the production system is not market oriented. The low status of market oriented agriculture is the result of weak institutional performance such as agricultural extension. Different results on the effect of agricultural extension on market participation of farmers depicted contradictory results (positive, negative and no effect). In this study to assess the direction of effect, a Meta Analysis is performed using 16 studies which were selected based on PRISMA criteria. Based on the random effect model, the result depicted that agricultural extension services have positive effect, even if the effect is not strong enough, on the market participation decision of agricultural producers. Moreover, the subgroup analysis showed different effect of agricultural extension service for different producers. The effect for pulse crops, cereal crops and horticultural crops is strong whereas, for vegetables and livestock it is very poor. Therefore, market oriented extension service should be provided for all producers, particularly for vegetables and livestock producers, to improve the welfare and the food security status of the farmers.

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1126 59 Ave East, V5X 1Y9, Vancouver BC, Canada
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INDEX

INDEX

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