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ABSTRACT BOOK

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ABSTRACTS

Keynote Presentations

Mitigating Climate Change: A Reality Check

Paul Ekins

University College London (UCL)

Abstract:

Large-scale mitigation of climate change through slowing and stopping global warming will require innovation in socio-technical systems, and in human behaviour, on an unprecedented scale. This lecture provides a broad overview of the changes required to meet this goal: in technologies, social institutions and individual behaviours across the main activities that emit greenhouse gases (GHGs): power generation, transport, industry, buildings, and agriculture, covering issues around the supply and demand of energy and materials, and the efficiency of their use. Mitigation will also require the large-scale implementation of methods to remove GHGs from the atmosphere. The changes required, involving both innovation and very large investments in technologies and infrastructure, will have enormous and worldwide economic implications, that will differ across economic sectors and countries. The available evidence points clearly to the economic impacts of decarbonisation being positive for the majority of countries. For the world as a whole, the huge benefits of avoiding climate change would be augmented by the also very large health benefits of reduce local air pollution from stopping the burning of fossil fuels. Climate change mitigation emerges as perhaps the single largest welfare-enhancing programme that humanity could undertake.

Biography:

Paul Ekins has a Ph.D. in economics from the University of London and is Professor of Resources and Environmental Policy at the UCL Institute for Sustainable Resources at University College London. He was Deputy Director of the UK Energy Research Centre from 2014-2019.He is a member of UNEP's International Resource Panel, for which he has lead reports on resource efficiency and critical minerals for the energy transition. His new book is *Stopping Climate Change: Policies for Real Zero* (Routledge, 2024). In 1994, Paul Ekins received a Global 500 Award 'for outstanding environmental achievement' from the United Nations Environment Programme. In the UK New Year's Honours List for 2015 he received an OBE for services to environmental policy.

The Ecosystem Effects of Ocean Acidification

Jason Hall-Spencer

Universities of Plymouth (UK) and Tsukuba (Japan)

Abstract:

This talk will highlight advanced made over the past 15 years in the use of natural analogues of future ocean conditions, with a focus on CO_2 seeps which have been used to assess the combined ecological effects of climate change, such as warming, acidification, hypoxia and increased storminess. The methods we have used to monitor changes in the blue carbon cycle and marine ecosystem services could be applied to areas that have conditions that provide insights into the future of northern marine ecosystems and the opportunities there are for coastal communities to adapt to these changes. The talk will start with a description of how natural analogues have been identified and used to assess the benefits of reductions in CO_2 emissions, and the risks of carbon capture storage leaks. It will showcase some examples from around the world and introduce the International CO_2 Natural Analogues Network (ICONA) that has been designed to enable international collaborations and to standardize methods.

Biography:

Jason Hall-Spencer has advanced marine science by researching ocean acidification and cold-water reefs. His work, published in top journals like *Nature*, informs UN and IPCC reports on climate impacts. Using multi-beam sonar and submersibles, he's discovered vast deep sea coral reefs and revealed damage from modern fishing. His research has shaped global policies, including the UK Marine and Coastal Access Act (2009), which established Marine Protected Areas (MPAs) and fisheries closures. He is working as part of the International CO_2 Natural Analogues (ICONA) programme using volcanic seeps as windows into the future of our ocean.

Urban Runoffs: Investigating Chemical Changes During Extreme Weather Events

Mira Petrovic[1,2]*, Isabel Cadena[1,3], Sergi Sabater[1,3]

[1]Catalan institute for Water Research (ICRA), Girona, Spain
[2]Catalan Institution for research and Advance Studies (ICREA)., barcelona, Spain
[3]University of Girona, Giroan, Spain

Abstract:

Rain and storm events wash contaminants from urban surfaces, including roads, pavements, residential and industrial areas, as well as green surfaces. Typically, contaminants accumulated on city surfaces are mobilized in pulses, often triggered by rainfall events or street washing. Additionally, airborne contaminants can be washed down during rainfall. Thus, urban runoff is recognized as a non-point source of contamination, conveying a complex mixture of pollutants such as trace metals, suspended solids, nutrients, salts and a wide range of organic compounds including pesticides, pharmaceuticals, veterinary drugs, industrial chemicals, personal care products, surfactants, tire-related compounds, plasticizers and microplastics.

In this work we use a lineup of liquid chromatography-high resolution mass spectrometry (LC-HRMS) methodologies, encompassing non-target screening (to extract information from various databases with hundreds of thousands of compounds), suspect screening (using in-house database covering +1,200 compounds), and wide-scope target analysis (quantitative method for +900 compounds), utilizing a LC-HRMS (Orbitrap) instrument, for the comprehensive characterization of organic contaminants in water samples collected as a first flush during several rain events in Spain.

The findings indicate the presence of +100 contaminants derived from different sources (traffic, gardening, elution from building materials, atmospheric deposition). Given the varied origins of these contaminants a comprehensive assessment is crucial to understand their potential impacts on both environmental and human health. This evaluation involves analyzing the types and concentrations of contaminants present, assessing their pathways of transport and exposure, and determining the associated risks to ecosystems, water quality, and public health.

Biography:

ICREA Research Professor since December 2005. PhD in Chemistry (1995), Faculty of Chemical Engineering and Technology, University of Zagreb, Croatia. From 1999-2011 research scientist at the Department of Environmental Chemistry, Institute for Environmental Assessment and Water Studies (IDAEA-CSIC), Barcelona. Since July 2011 senior researcher at the Catalan Institute for Water Research (ICRA), Girona, Spain. At ICRA she is the Deputy Director responsible for research and the leader of the research line Contaminants in water treatment processes. She has published over 280 research papers and 31 book chapters, edited 8 books. Her current H-index is 104, with greater than 24.000 citations (Scopus).

Sustainable Microplastics Remediation: Addressing Challenges and Exploring Effective Solutions

Luiza Cintra Campos

Centre for Urban Sustainability and Resilience, Department of Civil, Environmental & Geomatic Engineering, University College London, WC1E 6BT, United Kingdom.

Abstract:

This presentation provides an overview of microplastics (MPs), their environmental impact, and the urgent need for effective remediation methods. It delves into various remediation techniques, including Advanced Oxidation Processes (AOPs), Phytoremediation via Hydroponics, Coagulation-flocculation-sedimentation, and Sand Filtration. Each method is examined in terms of its efficacy, challenges, and potential for sustainable application. The presentation discusses the principles behind each technique and their specific mechanisms for microplastics removal from water systems. Furthermore, it addresses the practical challenges associated with implementing these methods on a larger scale and explores potential solutions to overcome these hurdles. Concluding remarks highlight the importance of interdisciplinary collaboration, innovation, and continuous research efforts in the pursuit of sustainable microplastics remediation strategies.

Biography:

Luiza Cintra Campos, a civil engineer, holds a PhD from Imperial College, UK, and an MSc in Water and Sanitation from the University of Sao Paulo, Brazil. Prior to her tenure in the UK, she dedicated ten years to the state water and sanitation company of Goias and another decade as a lecturer at the Federal University of Goias in Brazil. Presently, she serves as a Professor of Environmental Engineering at University College London, specializing in water and sanitation. Her research focus on advancing developments in water treatment technologies; exploring interlinkages in the water nexus; and promoting improvements in sanitation, hygiene and health.

Assessment and Adverse Health Impact of Environmental Contaminants in Southern Alberta, Canada

Hamid R. Habibi

Department of Biological Sciences, University of Calgary, Calgary, Alberta, Canada.

Abstract:

There is increasing awareness of environmental contaminants with hormone-like activities that adversely impact the health of humans and wildlife. Our studies demonstrated the presence of a number of contaminants in rivers located in Southern Alberta, Canada. To assess the toxicity of the chemical contaminants, we performed studies to investigate the health status of the fish in the contaminated rives, followed by controlled laboratory studies to test the health impact of the contaminants at the concentrations detected in the environment. Using various biological markers, we demonstrated the presence of compounds with hormone-like activity in the aquatic ecosystem. We performed experiments to investigate the mechanisms by which the waterborne contaminants disrupt reproduction, metabolism and development, using cellular, molecular, transcriptomics and metabolomics approaches. The results demonstrate significant metabolic dysregulation following exposure to low concentrations of contaminants. Transcriptomic analysis identified new cellular responses and biological endpoints and provided information on mechanism-based cell and tissue responses affecting the energy cycle and reproduction. In addition, we observed changes in neuro stem cell development associated with hyperactivity following exposure to low environmentally relevant concentrations of contaminants. Our findings provide a framework for a better understanding of the ecological consequences of exposure to contaminants and resulting reproductive abnormalities seen in fish and other vertebrates. Our results also provide a mechanistic link between the observed levels of environmental contaminants and phenotypes observed in various epidemiological studies worldwide.

Biography:

Hamid R. Habibi is a full Professor at the Department of Biological Sciences, Faculty of Science, and Physiology and Pharmacology at the Cumming School of Medicine. He received a number of international awards, including the Grace Pickford Medal by the International Federation of Comparative Endocrinological Societies and a Professorship/Lectureship in Science and Sustainable Development by UNESCO and the World Academy of Science. He was also recognized by the Award of Excellence in Community Outreach for promoting public awareness of environmental issues from the University of Calgary. He has published over 210 peer-reviewed full papers and trained over 51 graduate students and postdoctoral fellows during the past 35 years.

Oral Presentations

The Effect of a Copper Foundry on SO_2 Levels in Small Coastal City in Chile

Patricio Perez[1], Camilo Menares[2], Francisco Gomez[2]

[1]Departamento de Fisica, Universidad de Santiago de Chile; [2] Departamento de Geofisica, Facultad de Ciencias Fisicas y Matematicas, Universidad de Chile.

Abstract:

Quintero is a Chilean coastal town with 25000 habitants, located 160 km northwest from Santiago. In the surrounding we can find a high concentration of industries which emit an important amount of air pollutants. Among these pollutants, it stands out sulfur dioxide, which often exceeds international standards. We have investigated what are the most relevant sources of SO_2 measured in Quintero on days of episodes that have been of concern because of reports of fainting and vomiting in dozens of people. After analyzing the meteorological conditions associated with levels of SO_2 we observe that high values occur mainly during early hours, when the wind has a component from the east (from land towards ocean). Highest concentrations tend to coincide with northeast winds. Towards northeast of Quintero, at a distance of 10 km from downtown, we can find a thermal power plant and a copper foundry, in a complex by name Ventanas. These two sources are candidates to be responsible of the SO_2 episodes in Quintero. In order to protect the population from toxic levels of sulfur dioxide, three approaches are possible: 1. To generate a warning system based on an air quality forecasting model 2. To decrease the emissions from identified sources by improving technology 3. Shut down of selected sources. With respect to 1., we have developed a SO_2 forecasting model based on artificial neural networks which rests on historical data from meteorology and pollutants. We have obtained a reasonable accuracy, but the model has not been implemented operationally. With respect to 2., between 2019 and 2021 there has been a partial reduction of operation of Ventanas power plan. This action meant a significant decrease on average SO_2 concentrations in Quintero. However, the elimination of toxic events was only verified after shut down of the copper foundry by mid 2022.

Biography:

Patricio Perez was born in Linares, Chile. In 1984 he obtained a PHD in molecular Physics at Purdue University, USA. His research has been focused on theory of artificial neural networks and its applications to air quality forecasting. By 2020 he published a pioneer work on PM2.5 forecasting using neural networks. Since then he has developed a number of forecasting models for different pollutants and cities in Chile. At this moment he is a full professor at the Physics Department, Universidad de Santiago de Chile.

Environmental Pollution and Transport of Antibiotics in Riparian Zone

Lei Tong[1,2]*, Yuqiong Li[2], Naijin Ma[2], Cui Gan[2], Zhaobo Luo[2]

[1]MOE Key Laboratory of Groundwater Quality and Health, China University of Geosciences, Wuhan, China; [2]School of Environmental Studies, China University of Geosciences, Wuhan, China

Abstract:

The riparian zone (RZ) acts as a crucial interface connecting surface water and groundwater, known for its pollutant buffering capabilities. Despite its recognized importance, little attention has been given to the decontamination of trace organic compounds, particularly antibiotics.

Our study investigates the distribution of 21 antibiotics and 4 sulfonamide metabolites in river water and groundwater within the lower Hanjiang River region, exploring the diffusion and exchange of contaminants influenced by water conservancy projects such as the Xinglong Dam and the Yangtze-Hanjiang Water Diversion Project. The redox dynamics of iron, integral to the degradation and conversion of co-existing organic pollutants, remain unclear in the hyporheic zone. Therefore, our research unveils the characteristics and mechanisms of reactive co-transport of Fe^{2+} and antibiotics during groundwater discharge through quartz sand column simulations. Notably, Fe^{2+} demonstrated an inhibitory effect on the transport of three

antibiotics: sulfamethoxazole (SMX), ofloxacin (OFL), and oxytetracycline (OTC), with OTC exhibiting the highest inhibition (~80%) followed by OFL (~20%) and SMX (~2%). Besides, column experiments simulate the co-transport of goethite colloid (Goe), Fe^{2+}, and OTC across varying temperatures, revealing that lower temperatures and the presence of Fe-OTC complexes enhance Goe transport, while OTC inhibits it by reducing the Zeta potential of quartz sand. The study highlights the influence of Goe on the transformation of Fe^{2+} to goethite, guided by template-directed nucleation and growth processes. OTC removal is primarily governed by weak and chemical adsorption onto iron minerals and hydroxyl radicals generated within the system.

Biography:

Lei Tong, Professor, PhD Supervisor, School of Environmental Studies, China University of Geosciences (Wuhan). Her research focuses on the environmental monitoring of emerging contaminants, the environmental toxicity assessment of antibiotics and resistance genes, and their influence on element geochemical cycles. Her work has been funded by the National Natural Science Foundation, National Key Research and Development Project. She has published more than 40 papers in ES&T, CRES&T, JHM, and others. She is a member of the editorial board of Geology in China.

Citizen Science Activities in Monitoring River Ecosystems Means Many Benefits

Bruna Gumiero[2*], Francesco di Grazia[1], Alessio Polvani[1] and Steven Loiselle[1]

1 Università degli Studi di Siena, Italia
2 Università degli Studi di Bologna, Italia

Abstract:

Citizen science (CS) represents a promising avenue for improving the management of global water resources, but its full potential remains unrealized despite widespread recognition of its benefits. Integrating citizen science into freshwater research offers unprecedented benefits, including cost-effective data collection and community engagement opportunities.

Key issues such as precision, accuracy and reliability of methods persist, including the need for meticulous planning to ensure data quality and ethical considerations to safeguard the well-being of participants. To optimize the impact of CS, several strategies are proposed: promoting awareness, ensuring that the data generated serves a purpose by moving data from information to action, recognizing each individual's potential to engage as a citizen scientist, understanding the subjectivity of "good water quality" and establishing effective communication channels for the two-way transfer of data and information.

The results of 5 years of water monitoring will be presented with chemical analyzes such as nitrates and phosphates and bacteriological analyzes (Escherichia coli) carried out by citizens in the watercourse network in a municipality in the province of Bologna. Furthermore, an analysis will be made of the critical issues and benefits achieved.

Reversible Capture and Release of Carbon Dioxide Using Polyamine

Eri Yoshida

Toyohashi University of Technology, Japan

Abstract:

Global warming, accelerated by increased CO_2 emissions, is a pressing worldwide issue. To address this, carbon capture and storage (CCS), which involves capturing CO_2, compressing it for transportation, and injecting it deep underground for its permanent storage, is currently the most promising method. The key to implementing CCS in an energy-saving manner lies in the effective absorption and desorption of CO_2 to regenerate the absorbent. This paper describes the reversible capture and release of CO_2 as carbonic acid (CA) in an aqueous medium using polyamine.

When gaseous CO_2 was introduced into an aqueous polyamine solution, the polyamine immediately captured CA through an acid-base reaction to produce polyammonium bicarbonate. This polyelectrolyte was isolated by freeze-drying with a 97% yield. The isolated polymer began to release the CA at 68.6°C and completed the release upon continuous heating. Conversely, the polyammonium bicarbonate solution released the CA at room temperature upon introducing N_2, transforming the polymer from the bicarbonate form to the carbonate. The polymer effectively captured CA again upon a second CO_2 introduction, returning to the bicarbonate form. This reversible alteration through capturing and releasing CA was repeatable with repetitive CO_2-N_2 introductions. The polyamine shows promise as a material for efficient CO_2 absorption and desorption in an aqueous medium.

Biography:

Eri Yoshida earned her Ph.D. in polymer engineering at the Tokyo Institute of Technology in Japan. After completing her Ph.D., she joined the Kyoto Institute of Technology as an Assistant Professor. In 1999, as a visiting scientist, she engaged in studies on the utilization of supercritical CO_2 at the University of North Carolina at Chapel Hill. She moved to Toyohashi University of Technology as an Associate Professor in 2004. Her current research interests include CO_2 capture technologies, chemical recycling of waste plastics, and artificial biomembrane models using synthetic polymer vesicles.

Enterovirus Surveillance in Spanish Wastewater in the Present Situation of Polio Eradication

Albert Bosch[1]*, Albert Carcereny[1], David García-Pedemonte[1], Maria I Costafreda[1], Carme Chacón[2], Margarita Palau[3], Belén Galofré[4], Miquel Paraira[4], Susana Guix[1], Rosa M Pintó[1]

[1]Enteric Virus Laboratory, Department of Genetics, Microbiology and Statistics, School of Biology, and Research Institute of Nutrition and Food Safety (INSA-UB), University of Barcelona, 08028 Barcelona, Spain. [2]Public Health Office, Health Departament, Generalitat de Catalunya, Spain. [3]General Directorate of Public Health, Ministry of Health, Madrid, Spain. [4]Aigües de Barcelona, Barcelona, Spain.

Abstract:

The aim of our study was to monitor enterovirus presence and diversity, with special attention to poliovirus, in samples from two large wastewater treatment plants in Spain, between 2022 and 2024. With this purpose, a RT-qPCR targeting the conserved 5'UTR region of the enterovirus genome was designed to quantify enterovirus species every two weeks. Additionally, two amplicon NGS direct-detection methods were used: a generic approach consisting in a semi-nested RT-PCR of a 400-bp VP1 region, allowing the direct identification of all enterovirus serotypes, and a nested RT-PCR of the entire capsid region, followed by amplification of the full 1000-bp VP1 gene, allowing a more specific detection of enterovirus C, including poliovirus. All amplicons were sequenced using MinION (Oxford Nanopore Technologies) technology and a bioinformatic pipeline based on the Vsearch software was designed, enabling to compare the sequences from an in-house enterovirus database. The results obtained were compared with genetic diversity observed at the clinical level at during the same timeframe.

Both clinical data and wastewater data show Enterovirus B species as the majority group, but as opposed to clinical data, wastewater data shows a high prevalence of several enteroviruses through time: Echovirus 11 and Coxsackievirus B5 throughout most of the duration of the study, with Echovirus 9 and Coxsackievirus B2 being also present with minor frequencies. Eight enteroviruses associated to polio-like flaccid paralysis and other severe neural syndromes were detected in very low proportions in wastewater: Coxsackievirus A20, A21 and A22 and Enterovirus A71, D68, C99, C105 and C109, these latter three belonging to Cluster C enteroviruses. Nevertheless, no poliovirus sequences were detected although enterovirus related to polio-like flaccid paralysis were found.

Biography:

Albert Bosch (Emeritus Professor of Microbiology, and cohead of the Enteric Virus Laboratory, UB) with over 40 years of experience in Virology and has published over two hundred peer-reviewed articles on

enteric viruses, as well as several complete books (h-Index=67, Google scholar). He holds 2 PCT patents under exploitation. In the last years he has been fully committed to water-based epidemiology studies of SARS-CoV-2 and other health-significant viruses. Recently been ranked among the top 2% scientists in Microbiology (PLOS Biology, 2021). President of the Spanish Society for Virology and President of the International Society for Food and Environmental Virology.

Learning SARS-CoV-2 Variant Dynamics Through Wastewater Surveillance

Rosa M. Pinto[1]*, Albert Carcereny[1], David Garcia-Pedemonte[1], Maria Isabel Costafreda[1], Margarita Palau[2], Jacobo Mendioroz[3], Susana Guix[1], Albert Bosch[1]

[1]Enteric Virus Laboratory, Department of Genetics, Microbiology and Statistics, School of Biology, and Research Institute of Nutrition and Food Safety (INSA-UB), University of Barcelona, 08028 Barcelona, Spain. [2]General Directorate of Public Health, Ministry of Health, Madrid, Spain. [3]Public Health Office, Health Departament, Generalitat de Catalunya, Spain.

Abstract:

Our study aims to infer the outcompetition dynamics of SARS-CoV-2 variants at the population level to identify factors influencing the dominance of a given variant over its predecessor.

Weekly monitoring of variants was conducted in 90 wastewater treatment plants covering a great part of the Spanish territory, using duplex RT-qPCR assays targeting signature indels or SNVs for each variant, and NGS of the spike gene.

Relationship between emerging variants was analysed using linear regressions on RT-qPCR and NGS data. Linear regressions slopes were used to measure the outcompetition rates. The effect of variant entry ratio, diversity of the variant swarms at the moment of a new variant introduction, and herd immunity on the outcompetition rate was studied.

Significant differences in outcompetition rates were observed among variants, with Delta and Omicron BA.1 being the fastest. The outcompetition rate showed significant positive correlations with the variant entry ratio and herd immunity, while a negative correlation was observed with the Shannon entropy. The Shannon entropy and the herd immunity exhibited a strong positive correlation.

Wastewater surveillance allows for a comprehensive analysis of factors influencing the virus behaviour. Our findings highlight the importance of considering variant entry ratio, variant swarm complexity of the receiving population, and herd immunity in understanding the dynamics of SARS-CoV-2 variants.

Biography:

Rosa M Pinto is Full Professor of Microbiology being her field of expertise the molecular biology of enteric viruses. She has published over 140 peer-reviewed articles. With more than 9.980 citations, she holds a Google Scholar h index of 57 (SCI h index of 45) being classified at position 1.754 (123.400) in the 2024 Ranking of researchers in Spain and Spaniards abroad and at position 302 in the Ranking of women Researchers in Spain and Spaniards abroad (11.394). She holds two PCT patents under exploitation by BioMerieux. She is a member of the Royal European Academy of Doctors.

Eco-friendly Adsorbent for Dye Removal

Aree Choodum[1]*, Kharittha Phatthanawiwat[1], Chanadda Phawachalotorn[2], Worawit Wongniramaikul[1]

[1]Integrated Science and Technology Research Center, Faculty of Technology and Environment, Prince of Songkla University, Phuket Campus, Kathu, Phuket 83120, Thailand
[2]King Mongkut's Institute of Technology Ladkrabang, Prince of Chumphon Campus, Chumphon 86160, Thailand

Abstract:

An eco-friendly adsorbent was successfully developed for removing methylene blue (MB) from water. Dried mangosteen peel waste particles (DMP) were immobilized in starch cryogel, creating an eco-friendly com-

posite tablet (Cry-DMP). This composite efficiently removes MB, achieving up to 97.2% removal in synthetic water and 70.8% in real wastewater from the Batik industrial sector, without requiring activation of the DMPs. The primary adsorption mechanism involves electrostatic attraction of the cationic MB to the negatively charged surface of Cry-DMP, with additional contributions from π–π interactions and hydrogen bonding. Equilibrium results were best explained by the Langmuir model (R^2 = 0.9902), indicating a maximal adsorption capacity of 26.53 mg g^{-1} for MB. Kinetic analysis showed that the pseudo-second-order model best represented the adsorption kinetics (R^2 = 1). Thermodynamic analysis indicated that MB adsorption onto Cry-DMP is spontaneous and endothermic. Cry-DMP effectively removes MB and other cationic dyes but is ineffective against anionic dyes, highlighting its selective adsorption capabilities. These findings underscore the effectiveness of Cry-DMP as an eco-friendly adsorbent for MB and demonstrate the feasibility of utilizing waste in a greener approach.

Biography:

Aree Choodum received her BSc degree in Chemistry in 2002, her MSc in Analytical Chemistry in 2005, and her PhD in Chemistry in 2009, all from Prince of Songkla University, Thailand. She is currently an Associate Professor of Analytical Chemistry at the Faculty of Technology and Environment, Prince of Songkla University, Phuket Campus, Thailand. Her research interests focus on the development of green composite materials for environmental applications, including pollutant detection and removal. She has published over 46 peer-reviewed articles in international journals and has delivered more than 25 presentations at national and international conferences.

Integrated Biodegradable Material for Augmented Nitrate Removal in Water

Worawit Wongniramaikul[1]*, Khoreeyoh Mahama[1], Petcharawut Ramsiri[1], and Aree Choodum[1]

[1]Integrated Science and Technology Research Center, Faculty of Technology and Environment, Prince of Songkla University, Phuket Campus, Kathu, Phuket 83120, Thailand

Abstract:

The detrimental impact of elevated nitrate levels in water on aquatic ecosystems, particularly the acceleration of eutrophication, was widely acknowledged. This study focused on enhancing nitrate adsorption in water by immobilizing zinc powder onto a biodegradable material, namely calcium cross-linked polyvinyl alcohol (Zn-Ca-PVA) film. Through optimization, the ideal synthesis conditions were determined: a 10% PVA solution, 15 g of red lime in 6 L of ultrapure water, and the addition of 10 mg zinc powder. Application of the developed film to nitrate-contaminated water demonstrated a notable improvement in removal efficiency, rising from 47.82% to 78.47% compared to films without zinc powder. This enhancement suggests a collaborative mechanism involving both adsorption on the calcium cross-linked PVA film and catalytic reduction by the zinc powder embedded within the film. Furthermore, the adsorption characteristics of nitrate underwent a shift from conforming to the Langmuir model for Ca-PVA film to adhering to Freundlich models for Zn-Ca-PVA film. These findings highlight the considerable potential of Zn-Ca-PVA films for practical utilization in nitrate removal applications.

Biography:

Worawit Wongniramaikul earned his B.Sc. degree in Chemical Engineering in 1999, followed by an M.Sc. in Chemical Technology in 2002, and ultimately, a Ph.D. in Environmental Management in 2007, all from Chulalongkorn University, Thailand. Presently, he serves as an Associate Professor of Environmental Science at the Faculty of Technology and Environment, Prince of Songkla University, Phuket Campus, Thailand. His research endeavors center on material development for various environmental applications, with a particular focus on pollutant detection and water treatment.

Emerging Technologies and Flood Management

Monica Rivas Casado[1]*

[1]Cranfield University, United Kingdom

Abstract:

The impact of flood events has significantly increased over the last decades due to more intense and frequent rainfall events. The extreme rainfall events observed during September 2024 are the closest example, with floods sweeping multiple countries in Europe, as well as parts of England. Surface water flooding played a pre-dominant role, with many properties outside designated flood extents in England being unexpectedly affected by pluvial flooding. Some of the factors contributing to this include, flood modelling uncertainties, drainage network efficiency and the microtopographic configuration surrounding residential properties. Disruptive and digital technologies are starting to emerge as plausible tools to understand the factors governing surface water flooding, thus contributing to better inform flood management decisions. This oral contribution will review few applications of emerging technologies, such as unmanned aerial vehicles and artificial intelligence, which have the potential to enhance surface water flood management practices whilst increasing flood urban resilience.

Biography:

Monica Rivas Casado is recognised as a leading expert in the use of UAVs as a data acquisition platform to improve flood risk management in the UK and internationally. She is a Reader in Environmental Systems Engineering at Cranfield University. Her academic career has been built around the development of systems engineering solutions for the design of robust environmental monitoring strategies. Monica's research has been funded by EPSRC, NERC, BEIS, the Environment Agency and a vast range of industrial sponsors.

Poster Presentations

Strategic Conversion of Plastic Containers with Food Waste into Energy Through Thermo-chemical Processes

Dohee Kwon[1]*, Eilhann E. Kwon[1]

[1]Department of Earth Resources and Environmental Engineering, Hanyang University, Korea

Abstract:

Plastic valorization has received particular attention as an environmentally benign approach to achieve carbon neutrality and reduce greenhouse gas emissions. However, contaminated plastic and biomass waste mixtures present challenges for single-stream recycling. Currently, most waste mixtures are disposed of through landfill and incineration, causing significant environmental problems. In this study, catalytic pyrolysis and a CO_2 feedstock were used as a sustainable disposal and valorization method for converting plastic and biomass waste mixtures into energy-intensive products, especially syngas (H_2 and CO). A plastic container contaminated with a food waste mixture (PFW) was used as the model waste. The major products of the pyrolysis of PFW were liquid hydrocarbons (HC) (C_{7-30}) and wax-like HCs with negligible formation of oxygen-containing HCs. Since the high production of wax-like HCs can cause severe operating problems in thermochemical process, catalyst was employed to convert HCs into simpler product streams such as syngas. Employing Ni catalyst resulted in a tripled increase in syngas formation, but catalyst deactivation was observed. To suppress catalyst deactivation and promote CO formation, CO_2 was used. During the catalytic pyrolysis under CO_2, the syngas yield from PFW increased to 95.5% because the chemical reactions between CO_2 and liquid/wax-like HCs produced additional syngas. The catalytic reaction with CO_2 suppressed carbon deposition because long-chain HCs were converted to CO rather than coke.

Biography:

Dohee Kwon is currently a doctoral student in Environmental Catalysis and Combustion Laboratory of the Department of Earth Resources and Environmental Engineering at the University of Hanyang. She received her Master of degree in Environmental Engineering from the University of Sejong, Korea. Her current research broadly focuses on waste management, CO_2 utilization, and thermochemical processes.

Conversion of Toxic Chemicals into Syngas Through CO_2-assisted Catalytic Pyrolysis of Insulation Material Waste

Jung-Hun Kim1* and Eilhann E. Kwon1

1 Department of Earth Resources & Environmental Engineering, Hanyang University, Seoul 04763, Republic of Korea

Abstract:

The utilization of plastic-based insulation materials has been widely employed due to their exceptional durability, cost-effectiveness, lightweight nature, and low thermal conductivity. Nevertheless, recycling or recovery of insulation material waste (IMW) in construction waste is challenging due to its brittleness and often contaminated state. The landfilling or incineration of IMW could release toxic chemicals and hazardous air pollutants into the environment. Consequently, the generation of IMW in construction waste has emerged as an environmental issue. Thus, this study suggests pyrolysis platform as disposal management method of IMW that uses CO_2 as reactive medium. Pyrolysis of IMW, composed of polystyrene (PS) in the form of extruded polystyrene (XPS), yielded pyrogenic products containing toxic chemicals (styrene, prop-1-en-2-ylbenzene, but-1-ene-1,3-diyldibenzene, and 2-benzylnaphthalene). These toxic chemicals were converted into syngas, especially carbon monoxide (CO), through homogeneous reactions with CO_2 at 700 ˚C. Additionally, using a Ni/Al2O3 catalyst accelerated homogeneous reaction with CO_2. This showed 82.7% reduction in the total peak areas of chemical constituents that contain toxic substances in the pyrogenic oil compared to using N2 as a medium. Furthermore, the effectiveness of CO_2 is increased with higher atmospheric CO_2 concentrations. This study suggests catalytic pyrolysis under the CO_2 condition as sustainable and reliable pyrolysis platform that has ability to convert toxic chemicals derived from IMW into syngas through homogeneous reaction with CO_2.

Biography:

Jung-Hun Kim is a fourth-year Ph.D. student at Hanyang University in South Korea. He received bachelor's and master's degree in environmental engineering from Sejong University, South Korea. His research focuses on organic waste and carbon dioxide valorization into biofuel and syngas through pyrolysis. He has been published papers in Bioresource Technology, Cellulose, Chemical Engineering Journal, Journal of Cleaner Production, Journal of CO2 Utilization, Journal of Hazardous Materials, Energy, Energy Conversion and Management, and Science of The Total Environment.

Impact of Calcium Silicate Hydrate Content in Porous Concrete Composites on Continuous Flow Phosphate Removal from Water

Tarawee Taweekarn[1]*, Worawit Wongniramaikula[2], Aree Choodum[3]

Integrated Science and Technology Research Center, Faculty of Technology and Environment, Prince of Songkla University, Phuket Campus, Kathu, Phuket 83120, Thailand

Abstract:

Phosphate is a major pollutant that deteriorates water quality and leads to eutrophication, causing significant environmental issues, financial losses, economic challenges, and negative health implications. Therefore, phosphate removal and maintaining a low concentration of phosphate in water are crucial for minimizing and controlling water eutrophication. A novel calcium silicate hydrate (CSH) composite porous concrete (PC–CSH) was thus developed to effectively remove phosphate using a continuous flow system, and the influence of CSH content was reported. With an initial phosphate concentration of 50 mg L^{-1} and a flow rate

of 10 mg L^{-1}, a 2.5 cm length PC–CSH column with various amounts of CSH in 1 kg of porous concrete was investigated. It was found that 5 g of CSH achieved the highest adsorption capacity of 143.99 mg g^{-1}. The experimental data were analyzed using the Thomas models and a good correlation (R^2 = 0.7745–0.9157) was obtained. This study presents a promising method for contributing to the United Nations' Sustainable Development Goal (SDG) 14, Life Below Water, specifically Target 14.1, which aims to prevent and significantly reduce nutrient pollution by 2025.

Biography:

Tarawee Taweekarn is a postdoctoral researcher at the Faculty of Technology and Environment, Prince of Songkla University, Thailand. I earned my B.Sc. in Biology-Chemistry (2011), M.Sc. in Environmental Management (2015), and Ph.D. in Environmental Management Technology (2021) from Prince of Songkla University. My research focuses on developing environmentally friendly sensors for pollutant measurement and novel materials for pollutant removal in water. I have published over 13 peer-reviewed articles in international journals and have presented at numerous national and international conferences.

Toward Better Conservation: A Spatial Analysis of Species Occurrence Data from the Global Biodiversity Information Facility

Brian Blankespoor[1]*, Susmita Dasgupta[1], David Wheeler[1]

[1]World Bank, USA

Abstract:

The world is losing biodiversity at an unprecedented rate. One million plant and animal species may be near extinction, and the rate of species extinctions continues to increase. Unfortunately, conservation efforts worldwide are often hindered by limited information on critical ecosystems and biodiversity. To bridge this data gap, this paper builds on recent advances in machine-based pattern recognition to estimate species occurrence maps, using georeferenced open-source data from the Global Biodiversity Information Facility (GBIF). With currently available data, the estimation algorithms have produced maps for more than 600,000 vertebrates, arthropods, molluscs, other animals, vascular plants, fungi and other non-animal and non-plants. For validation, the algorithm-produced maps are compared with species-matched sets of expert maps for mammals, ants and vascular plants. Using comparative species density counts in a high-resolution grid, it finds close similarity in global distribution patterns, and traces regional differences to technical differences in estimation methods or cases where the boundaries of existing expert maps could be revised to reflect species-level patterns in GBIF reports. The algorithms are designed for rapid map updates and estimation of new maps with continued increases in GBIF occurrence reports. To illustrate a potential application, the paper uses the estimated maps to identify the global distributions of about 68,000 species with small (25 km x 25 km or less) found in a single country as candidate areas for conservation planning.

Biography:

Brian Blankespoor is a Senior Geographer in the Development Data Group of the World Bank. Over the past 16 years at the World Bank, his work focuses on the production of spatial data, integration of large data with automation, and spatial models for economic analysis. Prior to the World Bank, he held analytical positions in the private sector and World Wildlife Fund. He is a certified GISP (Geographic Information System Professional) and holds a M.Sc. in Applied Economics from The Johns Hopkins University, a M.Sc. in Geography from Oregon State University, and a B.Sc. in Computer Science from Calvin College.

Harmful impacts of synthetic chemical on endocrine system by using cosmetic

Sitara Anjum*

College of Earth and Environmental Science, University of the Punjab

Abstract:

The present study is about synthetic chemicals used in cosmetic products, especially lipstick, which have increased the risk of hormonal disorders in the human endocrine system. Most renowned brands use lead, dyes parabens, methylparaben, aluminum powder and titanium dioxide. Many researchers found that continued use of titanium dioxide leads to damaged DNA and ends up in the form of cancer. Due to their extensive production and widespread use, synthetic materials may also enter into different parts of the water and soil environment. The presence of such toxic contents should be monitored in cosmetics because of toxicological and pharmaceutical properties. The risk potential of such chemicals should be evaluated. Most importantly their impact on the human endocrine system and toxic chemicals may cause a threat to humans at a high level. This research mainly emphasizes on utilization of natural products and creating awareness among communities to protect them from the harmful impacts of toxic contents in cosmetics. This study provides guidelines for policymakers and industries.

Biography:

I am doing PhD from University of the Punjab, Lahore, Pakistan. I published my work in Journal of chemical society of Pakistan and serving reputed journals as a reviewer. Member of an American association for applied linguistic. Aim to eliminate toxicity from environment and explore beneficial methods for a healthier environment. Presently, working on air quality and water purification and finding suitable processes for the reduction of impurities. I am an enthusiastic and multidisciplinary professional having university level teaching and research.

Historical and Modern Records of Coastal Disasters from the Andaman Sea and Gulf of Thailand; Progress in Geological Research and Mitigation

Montri Choowong*, Akkaneewut Jirapinyakul, Vichai Chutkositkanon Santi Pailoplee, Sumet Phantuwongraj, Kantapon Suraprasit, Stapana Kongsen, Chanakan Ketthong, Sirawat Udomsak

Centre of Excellence for the Morphology of Earth Surface and Advanced Geohazards in Southeast Asia (MESA CE), Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok 10330, THAILAND

Abstract:

On the Andaman Sea coast, the Thai-Malay peninsula, the 2004 Indian Ocean tsunami was one of the most powerful natural disasters in historical records. The 2004 tsunami not only brought the immediate loss of thousands of lives, destructed the infrastructures, and eroded the coastal beach zone, but also prompted national and international reflections on the vulnerabilities and preparedness of coastal regions as well as the importance of disaster research. As one of the national geoscience research groups, we searched for the historical records of tsunamis along the Andaman coast, described the sedimentology of tsunami deposits, and monitored the recovery of the beach zone. Our outcomes provided substantial physical data for short- and long-term management along the Andaman area. On the eastern side of the Thai-Malay peninsula, several typhoons and tropical storms strike the coastal zone of the Gulf of Thailand with no historical records of tsunamis. Ancient tropical storms dating back to several thousand years ago left behind prominent washover sediments. We described the sedimentological characteristics of storms to understand hydrodynamic intensities and the impact on different shoreline patterns. Here we show an example of prominent storm deposits in comparison to the other extreme tropical cyclones. All these findings from our coastal disaster research are useful and would be valuable for understanding coastal dynamics to mitigate the impact of coastal hazards in the future.

Biography:

Montri Choowong is a professor and the director of the Centre of Excellence for the Morphology of Earth Surface and Advanced Geohazards in Southeast Asia (MESA CE), the Department of Geology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand. Professor Montri's research interests involve coastal and fluvial geomorphology, sedimentology, disaster management, and environmental studies.

Flood Risk Mapping for Improved Risk Assessment and Mitigation: The Case Study of the Montreal Region, Canada

Ankit Kumar[1], Ursula Eicker[2]

1 Building, Civil and Environmental Engineering Department, Concordia University, Montreal, H3G 1M8, Quebec, Canada
2 Canada Excellence Research Chair, Concordia University, ER-1431, Montreal, H3H 2L9, Quebec, Canada

Abstract:

Floods are one of the most frequently observed natural hazards that not only entail loss of human lives but also of public or private properties, delivering shocks to the economy. Recognizing the major impact of flooding, this paper describes the development of flood risk mapping for risk assessment and mitigation measures using a case study in the region of Montreal, Canada. Geographic Information System (GIS) and Analytic Hierarchy Process (AHP) methods were employed for the analysis, current and past flood information was collected and analyzed to develop complete flood models which were used to identify and pinpoint the location of high-risk zones for the purpose of better planning, emergency preparedness and response, and to gain insight for better flood risk governance. Besides analyzing the present flood situation in Montreal and the importance of flood risk maps for urban planning and flood risk governance, this paper finally discusses on how to use the flood risk map for effective decision making and the recommendations to build the resilience of communities and nations to disasters, such as given by the given by the United Nations Office for disaster risk reduction, UNISDR. This study is expected to contribute to the development of future flood management strategy for the Montreal case study and beyond that is needed to ensure safety for its people as well as valuable lessons to policymakers, urban planners, and stakeholders of the discipline.

Biography:

Ankit Kumar is a Civil Engineering graduate from Jamia Millia Islamia with extensive internship experience in public infrastructure and urban affairs. He has worked on high-impact research projects, including applications of machine learning in landslide mapping and the use of recycled materials in high-strength concrete. Ankit has also contributed to structural retrofitting studies in seismic regions. He is currently pursuing a Master of Applied Science in Building Engineering at Concordia University. Ankit has a strong foundation in civil engineering tools like AutoCAD and ArcGIS, and he has been recognized for his academic excellence and contributions to research.

ABSTRACTS

Oral Presentation

Impact Assessment (IA) 5.0: Open Source Frameworks to Enable the Transition from Project-level IA to Addressing 21st Century Global Drivers

Matthew I Bellgard[1]* and Stanley E Bellgard[2]

[1]University of East London, United Kingdom
[2]Department of Industry, Tourism and Trade. Australia.

Abstract:

Impact assessment (IA) is the process of identifying the future social, cultural and environmental consequences of current or proposed projects, e.g. mining, agriculture, forestry, renewable energy, and construction. There are four key actors during the (Environmental) Impact Assessment process: i) Applicant; ii) Environmental Assessment Practitioner; iii) Public / community directly/indirectly affected by the project; and iv) Regulatory Authority. There has been a number of excellent reviews of the future directions of project-centric IA (e.g. Bice and Fischer 2020, Impact Assessment and Project Appraisal, 38:2, 89-93 DOI:10.1080/14615517.2020.1731202, iema.net, www.fothergilltc.com).

Global decarbonisation and its Greenhouse Gas (GHG) Protocol reporting requirements challenge the scale and scope of IAs. Beyond the emphasis of addressing a project's direct consequences, IAs are now expected to capture and mitigate upstream and downstream global impacts, not to mention delivering to the 17 Sustainable Development Goals. Whilst it has been recognised that IA reports, typically captured in static PDF documents, are not fit-for-purpose, the outstanding challenge is to identify and implement appropriate digital frameworks that support global reporting demands now placed upon key IA actors.

We contend open source digital frameworks using open data standards are necessary to enable well-governed multiple-level access to empower all key IA actors. In addition, these *lakehouse* frameworks should also provide ongoing, dynamic near real-time data analysis to inform decision making both at the project and global scales, during and beyond project life. This presentation demonstrates feasibility to deliver the IA 5.0 aspirational goals using open source global digital health platforms in production.

Biography:

Matt Bellgard, Pro Vice Chancellor for Impact & Innovation, University of East London, leads the design and development of global digital health solutions addressing policy, privacy, and consent issues across multiple jurisdictions. Previously, as eResearch Director, Queensland University of Technology, Australia conceptualised and implemented a university-wide research-led digital strategy to deliver real-world outcomes. Prior, as inaugural Director of a WA Centre of Excellence delivered in the areas of health, drug development, bioinformatics, food-security, mining, radio astronomy, remote sensing. He led a project that changed Australian Government biosecurity policy, and co-authored 168 articles, co-inventor of 7 full patents and commercial software.

Effects of the Rare Earth Elements on Freshwater Organisms

Susanne Heise[1]*, Marion Revel[1,2], Chantal van Drimmelen[1]

[1]Hamburg University of Applied Sciences, Germany; [2]EAWAG, Switzerland

Abstract:

Rare earth elements (REEs) have unique physical and chemical properties and are therefore increasingly used in modern electronics, renewable energy technologies, electric vehicles, etc. With their increasing use, they are emitted more into the aquatic environment and are now considered emerging pollutants for which there are currently no legal limits. To set threshold concentrations for the future, it is necessary to carry out bioassays for risk assessment. However, toxicity testing of rare earths is challenging as there are a number of pitfalls such as their affinity to glass surfaces and their complex speciation chemistry. We have found that their toxicity in standardized algal growth inhibition tests is masked by complexation with inorganic phosphate and increases significantly when alternative phosphate sources are used. Also, toxicity differs between the various elements despite their similar chemistry: the standardised acute test with Daphnia magna showed a higher toxicity of gadolinium (Gd, heavy REE) compared to lanthanum (La, light REE). Synchrotron studies then revealed that La was mainly confined to the gastrointestinal tract, while Gd was distributed in the tissues. While acute tests are usually performed with high concentrations, even environmentally relevant concentrations caused behavioral changes in *Daphnia magna* and increased agility. Overall, impact assessment of rare earths is challenging but nevertheless needs to be addressed soon.

Biography:

Trained as a biological oceanographer, Susanne Heise has focused early in her career on the effects of contaminants on aquatic organisms. After working as a researcher after her PhD at different marine institutions and as consultant on sediment quality related issues, she has become a professor at the Hamburg University of Applied Sciences 2007 and founded her work group on Applied Aquatic Toxicology.

Per- and Polyfluorinated Substances (PFAS) in the Environment near a Hot-spot in Antwerp (Belgium): 25 years of Research on Distribution, Accumulation and Effects.

Lieven Bervoets[1]*, Cara Byns[1], Lies Teunen[1,2], Thimo Groffen[1]

[1]Department of Biology, University of Antwerp, Belgium; [2]Research Institute Nature and Forest, Belgium

Abstract:

The pollution of the environment with per- and polyfluorinated substances or PFAS is a worldwide problem. PFAS have been produced and applied in many consumer products for more than 50 years. This has resulted in their distribution to both the aquatic and the terrestrial environment from the Arctic to the Antarctic. However, their concentrations in environment and biota has reached very high levels in the vicinity of hotspots. Such a hot-spot is the 3M factory in Antwerp Belgium which is producing PFAS since the 1960s. In our research group of the University of Antwerp we are studying the presence, distribution in the environment and effects of PFAS, both legacy and emerging compounds, since early 2000. In this presentation an overview will be given of the studies conducted on PFAS in the aquatic and terrestrial environment during the last 24 years. The bioaccumulation in aquatic and terrestrial invertebrates and vertebrates will be discussed as well as the relationship between accumulated concentrations and effects at the biochemical, physiological and ecological level.

Environmental Performance Indicators in EMAS-registered and Non-EMAS-registered Organizations

Beata Paliwoda[1]*, Alina Matuszak-Flejszman[1]

[1]Poznan University of Economics and Business, Management Institute, Poznan, Poland

Abstract:

The Eco-Management and Audit Scheme (EMAS) is an environmental management system functioning in the European Union. EMAS requirements are higher than the requirements of ISO 14001. The main objec-

tive of the study was to extract the most important environmental indicators monitored by both groups of organizations (EMAS, and non-EMAS). Exploratory factor analysis was used for the study.

Among EMAS-registered organizations, four main components were identified: Compliance indicators (describing 17.7%% of the total variance); Pollution control indicators (15.3%); Resource Consumption indicators (11.6%), and Audits and Objectives indicators (9.3%).

Among non-EMAS organizations two components were identified: Environmental Audits and Training indicators (describing 40.7% of the total variance); and Resource Consumption indicators (25.6%).

In non-EMAS organizations, the main focus is on monitoring the effectiveness of environmental audits and training. This suggests that these organizations focus primarily on operational and educational activities related to compliance and internal competence building. Energy and water consumption are also monitored, but with a lower priority than audits and training. This indicates that while resource management is important, these organizations focus primarily on audits and training as core elements of their environmental strategy.

In EMAS-registered organizations, there is a strong focus on regulatory compliance. The second priority is monitoring the elimination rates of harmful substances from waste and the amount of pollutants emitted into the air. This reflects an advanced approach to pollution control and minimizing environmental impact. Monitoring energy and water consumption is the third priority. The fourth component is monitoring environmental audits and indicators of achieving environmental goals.

Biography:

Beata Paliwoda, PhD. Doctor of Economy, graduated from the Poznan University of Economics and Business (PUEB) with Master's degrees in Quality Management (2011) and Economic Consulting (2012). Completed executive education at Ontario Western University (2015) and defended PhD on the effectiveness of the Eco-management and Audit Scheme (2016). A professional career built while working in the automotive, railway and aviation industries, as well as a management systems consultant. Authorized Representative of the PUEB Rector for Ecology & Environmental Affairs (2024-2028 term). A lecturer at the PUEB, consultant and auditor of ISO 9001, ISO 14001 and AS 9100.

Jet-like Flows in a Vegetated Sea and River Current

Michele Mossa*

Polytechnic University of Bari, DICATECh, Italy

Abstract:

Jet-like flows are ubiquitous in the atmosphere and oceans. Thus, the thorough investigation of their behavior is fundamental. Nevertheless, how they are affected by vegetation or, generally speaking, by obstructions is a crucial aspect which has been poorly investigated up to now. The aim of the present research is to propose an analysis of jet-like flows in the presence of obstructions. In this investigation the jet-like flow is assumed homogeneous, turbulent, and with the same density of the surrounding fluid. Laws of momentum deficit, length scales, velocity scales, and jet center line are analytically deduced. These analytical solutions are compared with some experimental data, showing a good agreement.

Identifying and Monitoring Priority Areas for Methane Emissions Reduction

Susmita Dasgupta, Somik Lall, David Wheeler

The World Bank

Abstract:

This paper identifies high-priority areas for methane emissions reduction and estimates recent emissions changes in those areas using atmospheric concentration data from the European Space Agency's Sentinel-5P satellite platform. The modeling approach is illustrated with three case studies: landfills in Spain (Ma-

drid), irrigated rice production in India (Karnal district, Haryana state), and oil production in Iraq (Al Amarah district, Maysan governorate). For each case, the paper estimates two change models by fixed effects: the monthly trend in methane concentration from January 2019 to November 2022, and the difference between mean concentration in 2022 and the previous three years. The paper estimates the change models for 775 high-priority areas and finds that cases with decreasing methane emissions are outnumbered four to one by cases with increasing emissions. The paper also analyzes trends in high-priority areas for seven major methane source sectors (agricultural soils, livestock, gas, oil, coal, landfills, and wastewater) and finds only two where emissions decreases outnumber increases (gas and oil). Among World Bank income groups, decreases outnumber increases in high-income economies but increases are hugely dominant in the other three groups. The paper concludes with a presentation of summary emissions trend reports for all 775 high-priority areas, with accompanying maps and an Excel file. As satellite-based monitoring becomes more widely employed, such reports will provide a useful template for judging further progress toward fulfillment of the Global Methane Pledge.

Estimating Extinction Risks with Species Occurrence Data from the Global Biodiversity Information Facility

Brian Blankespoor[1]*, Susmita Dasgupta[1], David Wheeler[1]

[1]World Bank, USA

Abstract:

The world faces a dire loss of biodiversity, necessitating a comprehensive global conservation strategy. Effective conservation requires accurate information about the spatial distribution of endangered species and the magnitude of local threats to their existence. Building on the occurrence maps of more than 600,000 vertebrates, invertebrates, other animals, plants, fungi and other species using georeferenced data from the Global Biodiversity Information Facility (GBIF), this paper constructs several extinction threat indicators. The indicators include habitat size, degree of formal protection and co-located population density for all species; sensitivity to population encroachment for terrestrial species; and, for marine species, co-located commercial fishing activity and degree of coverage by Exclusive Economic Zones. Then, the paper estimates an ordered logit model of the relationship between the species' threat indicators and their assignment by the International Union for Conservation of Nature (IUCN) to one of five extinction risk categories (Least Concerned, Near Threatened, Vulnerable, Endangered, Critically Endangered. The estimation sample comprises over 87,000 species in our GBIF database that have been assessed for risk by the IUCN. Model results are used to predict threat probabilities for more than 512,000 GBIF species that lack IUCN ratings. The results reveal many more potentially-threatened species across the globe, along with significantly-altered "conservation hotspot" maps. In closing, the paper notes that its methodology can support a rapid expansion in species maps and threat indicators as the GBIF database continues to grow.

Biography:

Brian Blankespoor is a Senior Geographer in the Development Data Group of the World Bank. Over the past 16 years at the World Bank, his work focuses on the production of spatial data, integration of large data with automation, and spatial models for economic analysis. Prior to the World Bank, he held analytical positions in the private sector and World Wildlife Fund. He is a certified GISP (Geographic Information System Professional) and holds a M.Sc. in Applied Economics from The Johns Hopkins University, a M.Sc. in Geography from Oregon State University, and a B.Sc. in Computer Science from Calvin College.

Climate Change, Agricultural Drainage and Water Storage in the Upper Midwestern USA

Joe Magner

Department of Bioproducts and Biosystems Engineering, University of Minnesota, USA

Abstract:

The hydrology of the upper Midwestern landscape is one of the most altered on the planet. States and local county governments in the upper Midwest of the USA have statues, rules, and governing entities that decide how to drain agricultural land within a watershed. The issue of an "adequate drainage outlet" into a natural drainage system has become a contentious legal and policy concern for farmers and environmentalists. A century ago, no one raised a concern about agricultural runoff and the potential impact on water quality, native plant habitat, or aquatic life. However, watershed contributing drainage area has progressively increased over decades because the Des Moine Lobe of the Laurentide Ice Mass is a relatively young glacial landscape with internal storage of precipitation. To efficiently grow row-crops, ditches and subsurface pipes have been installed by contractors. Sediment and nutrients have been transferred downstream impacting the environmental and ecological integrity of streams, rivers and lakes. States have developed management plans to restore the surface water quality by calling for more water storage. This creates a challenge for landowners who have noted an increase in precipitation over the last decade in 100 years. Many farmers see a need to improve drainage to keep their cropland viable. Drainage systems require maintenance over time, but many systems are undersized for today's climate and require more maintenance but drainage improvements. Given a wetter climate, can farmers and environmentalists agree upon solutions to store excess water yet improve the management of productive row crop land?

Biography:

Joe Magner, a licensed professional hydrologist (WI), a licensed professional soil scientist (MN) and an American Institute of Hydrology registered professional hydrogeologist working in both the public and private sectors for over 45 years. Magner is currently a research professor in the Department of Bioproducts & and Biosystems Engineering at the University of Minnesota, teaching and advising students in water quality, hydrology, ecological engineering and watershed management. Joe has successfully advised over 45 graduate students along with 100+ publications. Joe is a co-author of the 4th edition of *Hydrology and the Management of Watersheds* published by Wiley-Blackwell (2012).

Towards a More Circular Biobased Economy and Nutrient Use – The Role of Biogas Systems

Madeleine Larsson1*, Nancy Brett2, Karin Tonderski1, Geneviève S. Metson3, Nils-Hassan Quttineh4, Johanna Orsholm3

1Dep. of Management and Engineering, Linkoping University, Sweden; 2Dep. of Thematic Studies, Linkoping University, Sweden; 3Dep. of Physics, Chemistry and Biology, Linkoping University, Sweden; 4Dep. of Mathematics, Linkoping University, Sweden

Abstract:

Biogas systems have an important role to play in both the transition to renewable energy systems and in a circular economy by efficient use and recirculation of organic residues. In Sweden we have an increasing demand for biogas and a national production target has been suggested of 7 TWh by 2030 with the largest potential in the agricultural sector. This sector is also key for an efficient use of biofertilizers, which will increase when more biogas systems are implemented.

We have investigated the role of biogas systems to support increased resource efficiency on the Swedish island Gotland, including recovery and redistribution of nutrients within the agricultural sector. Our findings show that while expanding the biogas production (from 36 to 165 GWh) the produced biofertilizer could imply a more sustainable nutrient supply on the island. Comparing nutrient content in the future

biofertilizer with the crop need showed that the phosphorus demand on the island could be met if re-distributed to where it is needed. For nitrogen additional fertilizers would still be needed in some areas.

Despite the large biogas potential and potential role for redistribution of nutrients, the development has stagnated on the island. To better understand the stagnation and how barriers can be overcome we have performed an interview study with local actors on Gotland. Our initial findings show that biofertilizer is given very little attention as a product today, compared to the biogas, and to realise its full potential of replacing mineral fertilizers its value must be recognized.

Biography:

Madeleine Larsson is an Assistant Professor in Environmental Technology and Management at the Dep. of Management and Engineering, Linkoping University, Sweden, and the deputy director of the Biogas Solutions Research Center (https://www.biogasresearchcenter.se/en). With a background in chemical engineering and environmental science she is mainly doing research in the fields of environmental technology, and sustainable energy and nutrient supply. With a system perspective she aims to contribute to increased use of underutilized resources for a strengthened circular economy.

Biofertilisers from Biogas Plants – A Case for more Efficient Nutrient Recycling

Hans Andersson[2*], Karin Tonderski[1], and Madeleine Larsson[1]

[1] Linkoping University, Div Environmental Technology and Management, Linkoping Sweden
[2] Linkoping University, Div Business Administration, Linkoping Sweden

Abstract:

In Europe, biomethane production is expected to expand considerably, with a target of 30 bcm for 2030 and an associated increase of biofertilizer production of the same magnitude. This opens new opportunities to ensure a more efficient use of circular fertilisers but is not without challenges for the biogas industry. In this study we investigate current practices, business configurations, and future perspectives regarding biofertilisers management based on interviews with actors from various sectors in Sweden. Currently, approximately 58% of biofertilisers from the codigestion plants are returned to farmland without processing and with no intermediary actors involved, whereas less than 20% is processed to more valuable fertilizer products. Interviews revealed a surprisingly large variety of business configurations and indicated a potential for more new products and possibly new markets. A previous spatial analysis of the entire country showed that if all manure and sewage sludge were digested and the biofertilisers redistributed according to crop demand, Sweden could meet 91% of the crop P demand, i.e. almost eliminating the need for import of mineral P. For N, the corresponding figure was 44%. That national analysis clearly showed the potential role for biogas companies to be seen as fertilizer factories and contribute to secure fertilizers availability and improved nutrient circularity. To achieve this, a better business case for more efficient nutrient recycling must be developed as discussed in the study.

Visualizing Climate Change: Depicting Change in a Changing World

Michael P. Peterson*

Department of Geography/Geology, University of Nebraska at Omaha, Omaha, NE USA

Abstract:

Our understanding of climate change, and the factors that lead to it, often result from data visualizations, whether in graph or map form. Data visualization serves two purposes, the exploration of data to identify patterns and the communication of insights. Maps represent a vital visualization tool to convey the spatial dimension, an important aspect of climate change research. A variety of mapping methods have been used to depict both the sources of greenhouse gases and the modeling of climate change. These methods vary in

their ability to accurately represent data and communicate information. A great deal of climate and pollution data is provided at points that require data interpolation for effective visualization. Methods of interpolation vary in their ability to accurately calculate values for unknown points. Map animation is also used to show change over time as well as other non-temporal variables. The variety of mapping methods are presented through specific examples from research on point source pollution and climate change.

Biography:

Michael P. Peterson is a Professor of Geography at the University of Nebraska at Omaha in Nebraska, USA, where he offers courses in regional geography and the sustainability of natural resources. He has served as visiting professor at universities in Germany, Australia, Canada, Malaysia, China and New Zealand. His 50+ publications are in the areas of geography, cartography and environmental science. Book publications include Interactive and Animated Cartography and Mapping in the Cloud.

Spatial Optimization for Wind Energy Planning

Reto Spielhofer[1/2]*, Roel, May[1], Jonas Schwaab[2], Adrienne Gret-Regamey[2]

[1]Norwegian Institute for Nature Research – NINA, Norway; [2]Planning of Landscape and Urban Systems (PLUS), ETH Zurich, Switzerland

Abstract:

Wind energy production is increasingly being promoted worldwide to reduce carbon dioxide emissions while securing a growing energy demand. Although intended to counteract climate change, construction and operation of wind energy infrastructures change landscapes and impact ecosystems. Therefore, the planning and siting of wind energy is a complex, assessment that needs to simultaneously account for a variety of technical, ecological, social and economic constraints and their often-nonlinear relations. Spatial explicit mapping techniques have been widely applied to support wind energy planning in finding sites for wind energy production that fulfil the planning constraints. Although these methods provide a valuable basis for planning and decision making, they lack in an efficient communication of potential relations between constraints. Therefore, we present a spatial explicit multi-optimization method to disentangle non-linear synergies and trade-offs between planning constraints. The resulting pareto-optimal solutions uncover a range of optimal siting solutions. In addition, the results revealed off-site effects for different wind energy planning scenarios. Further, we outline how the method can be extended through the inclusion of further spatial information accounting for impacts on biodiversity and or ecosystem services. We conclude that the use of spatial optimization techniques in wind energy planning fosters the systemic understanding of planning decision and its impacts on social, ecological or economic factors. Finally, the communication of trade-offs and synergies between planning constraints can strengthen the negotiation in the planning process with different stakeholders and foster energy stewardship.

Biography:

Spielhofer is an early career researcher working at the Norwegian Institute for Nature Research (NINA). He is a trained Geographer from the University of Zurich with a specialization in geographic information systems (GIS) and holds a PhD of ETH Zurich in landscape planning. Currently, his main research focus lays on the integration of spatial data of ecosystem services and into planning and decision support systems.

Developing the First Fungal Toxicity Test for Antarctica Using an Endemic Fungal Species

Vink, Jordan Amy1,2*; Benaud, Nicole1; Vázquez-Campos, Xabier1,3; King, Catherine K.4; Wilkins, Daniel1,4; Ferrari, Belinda1,2

1 School of Biotechnology and Biomolecular Sciences, The University of New South Wales, Australia
2 Evolution and Ecology Research Centre, The University of New South Wales, Australia
3 NSW Systems Biology Initiative, School of Biotechnology and Biomolecular Sciences, The University of New South Wales, Australia

4 Environmental Stewardship Program, Australian Antarctic Division, Department of Climate Change, Energy, the Environment and Water, Australia

Abstract:

Antarctica's limited ice-free regions are experiencing increasing anthropogenic pressures from station operations, scientific research, and tourism, sometimes resulting in localised pollution from hydrocarbons and metals. The absence of specific environmental guidelines for contaminants in Antarctica complicates risk assessment and soil remediation efforts. Traditional single-species toxicity assays on Antarctic organisms face challenges due to the lack of standard test taxa, extreme conditions, and strict biosecurity regulations. This prompts the need for in-house solutions for ecological risk assessments. While several toxicity tests have included Antarctic plants, invertebrates, and algae, there is a significant gap in understanding fungal sensitivities. To address this, we are developing the first native Antarctic fungal toxicity test. Fungi are essential for a healthy ecosystem, even in Antarctica. Therefore, including fungal decomposers and nutrient cyclers in regulatory frameworks is crucial for enhancing the ecological relevance of future risk assessments in the region.

Numerous fungi were isolated from the soils of Robinson Ridge in eastern Antarctica. We screened 110 of these Antarctic fungi for their sensitivity to hydrocarbons. Of these, 62 isolates maintained stable growth, 16 were stimulated by hydrocarbons, and 25 showed no clear response to hydrocarbons. Seven fungal isolates showed a concentration-response relationship. These putatively sensitive strains are now the focus for single-species toxicity test development. Using amplicon sequencing, we also aim to understand how fungal communities respond to active bioremediation at Australia's Casey station. This research will contribute significantly to understanding Antarctic ecology, enhancing risk assessment methods, and understanding the impacts of contaminants in the Antarctic environment.

Biography:

Jordan Vink is a second-year PhD candidate at the University of New South Wales, Australia, supervised by Professor Belinda Ferrari. Her industry-linked PhD, in collaboration with the Australian Antarctic Division, focuses on developing a fungal toxicity test using a native Antarctic fungus to enhance risk assessment and regulatory frameworks in Antarctica. Jordan completed her bachelor's degree in biotechnology in 2020 and joined the Ferrari lab as an Honours student, researching a novel form of motility in *Streptomyces*. Her work in ecotoxicology encompasses ecology, bioremediation, biotechnology, and toxicology in an effort to improve environmental protection practices.

Does Increased Use of Organic Fertilizer Threaten Aquatic Ecosystem?

Yasuo Mitsui Nakamaru[1*], Retsushi Matsuda[1], Takeshi Sonoda[2]

[1]Tokyo University of Agriculture, Faculty of Bioindustry, Japan; [2]Division of Agricultural Science, The United Graduate School of Agricultural Science, Tottori, Japan

Abstract:

The local environmental risks of Cu and Zn from organic fertilizers were studied in northern Japan. The demand for organic fertilizer has been increasing recently, due to the need for land conservation and the increasing price of chemical fertilizer. The study area, especially the brackish lakes located near the farmlands, is important for inland fisheries. The risks posed by heavy metals to the brackish-water bivalve, *Corbicula japonica*, was therefore investigated as an example. The mobility and availability of Cu and Zn in organic fertilizers were evaluated in a field experiment. In the field experiment, potato (*Solanum tuberosum* L.) was cultivated using pig manure (PM) and chemical fertilizer. The applied chemical and organic fertilizers increased the soil-soluble and 0.1 N HCl-extractable Zn with increased nitrate. Considering the habitat and the LC50 values of C. japonica that were lower than the concentration of Cu and Zn in the soil solution phase, there is no significant risk from heavy metals in the organic fertilizers. However, the Kd values for Zn were significantly lower for CSS or the PM-applied plot in the field experiment soil, indicating a higher Zn desorption rate from organically fertilized soil particles. The potential risk of heavy metals from agricultural lands under changing climate conditions must therefore be monitored carefully. More detailed information will be presented at the conference (This study partially has been reported in STOTEN 163, 2023)

ABSTRACTS

Keynote Presentation

Bio-based Products and Bioenergy Recovery from Waste Streams in the Framework of a Circular Bioeconomy

Ivet Ferrer*, Marta Ballver, Evelyn Ruales, Marianna Garfí

Universitat Politecnica de Catalunya-BarcelonaTech

Abstract:

This presentation will provide an overview on the role of anaerobic digestion in microalgae biorefineries intended to recover value-added bio-based products and bioenergy from waste streams. Firstly, the results of several research studies conducted at bench and pilot-scale microalgae biorefineries treating industrial and urban wastewater will be summarised. Then, the sustainability of these processes according to environmental and social life cycle assessments will be presented. As will be seen, value-added products such as natural pigments (phycobiliproteins and carotenoids) could be recovered along with biogas from extracted biomass, providing economic and environmental benefits. However, there are still social barriers to be tackled by means of education and regulation to enhance social acceptance and steer the implementation of a circular bioeconomy.

Biography:

Ivet Ferrer is Agricultural Engineer by the University of Lleida, Spain (2002) and MSc. in Environmental Diagnostics by Cranfield University, UK (2003). In 2008 she obtained her Doctoral Degree in Environmental Science and Technology by the Universitat Autonoma de Barcelona. She has been research visitor at the Laboratory of Environmental Biotechnology (LBE-INRAE), France (2009) and Wageningen University, The Netherlands (2010).

Ivet Ferrer joined the Universitat Politecnica de Catalunya-BarcelonaTech in 2006. She is Full Professor at the Department of Civil and Environmental Engineering, and Vice-Dean of the Barcelona School of Civil Engineering. Her research is focused on the recovery of resources from waste streams to obtain bio-based products and bioenergy, in the framework of a circular bioeconomy. Her main fields of expertise are anaerobic digestion and algal biotechnologies.

Multigenerational and Transgenerational Impacts of Endocrine Disrupting Chemicals on Male Reproduction

Myung-Geol Pang[1]*

[1]Department of Animal Science and Technology and BET Research Institute, Chung-Ang University, South Korea

Abstract:

All ecosystems are increasingly being exposed to endocrine-disrupting chemicals (EDCs) that interfere with the normal body function. It is well known that exposure to EDCs poses health and reproductive risks. However, because multigenerational research on EDCs in humans has not been possible, it has not been proven whether these risks affect the next generation. Therefore, most recent studies have focused on the multigenerational effects of EDCs using animals to prove health risks passed on to the offsprings. Growing evidence suggests that atypical reproductive functions following EDC exposure may persist in their offspring. In our studies, the transmission of reproductive health risk from EDC exposure in the first generation was observed until the second generation, while no effect was detected from the third generation, so it also contains a positive message that if a free environmental hormone environ-

ment is maintained, although it takes time, reproductive and health risks to the next generation can be minimized. The multigenerational transmission of reproductive risks by EDCs revealed a mechanism that causes alterations in proteins related to fertility through epigenetic regulation of sperm DNA, thereby causing reproductive risks. Given the possibility of modification in fertility-related proteins and epigenetic information by EDC, our findings provide insight into the potential effects of exposure to EDCs during a critical period of development on fertility and health risks in future generations of animals and humans.

Acknowledgments: This study was financially supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF), Ministry of Education (NRF-2018R1A6A1A03025159).

Biography:

Myung-Geol Pang is a Professor at the Department of Animal Science & Technology, the Director of BET Research Institute at Chung-Ang University, Korea and a Fellow of the Korean Academy of Science and Technology. He was also the founder and CEO of GenDix, Korea. He was the President of the Korean Society of Developmental Biology. He received his Ph.D. in Cellular Endocrinology and Reproductive Biology from Eastern Virginia Medical School, USA and B.S. and M.S from Chung-Ang University. He has received several awards and published articles regarding environmental health in connection with endocrine-disrupting chemicals.

Rare Earth Element Dynamics - Implications for Environmental Toxicology and Human Health

Andrzej R. Reindl [1]* and Lidia Wolska [1]

[1] Department of Environmental Toxicology, Faculty of Health Sciences, Medical University of Gdansk, Gdansk, Poland

Abstract:

The rising concern over the impact of global warming on Antarctic ecosystems and marine environments has prompted extensive interdisciplinary research into rare earth elements (REEs) and their implications for environmental toxicology and human health. Through investigation on King George Island, we provided occurrence of REEs in bedrock and Antarctic soil, which is eroded due to glacier retreat. These findings indicate pathways of REE mobilization from rocks and soil into watercourses, emphasizing the reinforcement of REE influx into aquatic environment. Furthermore, our analysis encompasses Antarctic plants, wherein we identified the presence of REEs, demonstrating the capacity of its incorporate into plant tissues. Additionally, investigations onto marine mammals, serving as bioindicators of marine pollution, reveal diverse REE profiles influenced by geographical locations, as well as the ability of REE elimination through guano and fur. Simultaneously, examination of commercially important pelagic fish species underscores the presence of REEs in their muscles, reflecting ongoing environmental disturbances with significant dominance of heavy REEs. Human weekly intake of REEs of European sardine was estimated on 0.91 $\mu g \cdot kg^{-1}$ bw and was higher than in the case of Baltic herring consumer (0.18 $\mu g \cdot kg^{-1}$ bw). Such results underscore the urgent need for comprehensive assessment of marine ecosystems in the face of stressors associated with climate change. Our interdisciplinary research sheds light on the complex biogeochemical interactions governing REEs dynamics and trophic transfer in the environments, with significant implications for human health through fish consumption. Understanding these processes is crucial for mitigating escalating environmental threats and safeguarding human health.

Biography:

Andrzej R. Reindl is an Assistant Professor in the Department of Environmental Toxicology, Faculty of Health Sciences, at the Medical University of Gdansk. He holds a Ph.D. from the University of Gdansk, specializing in marine chemistry. Additionally, he is a lawyer and a court expert at the District Court in Gdansk. His research interests revolve around the internal distribution of persistent pollutants and the pathways of elimination and intergenerational transfer. An important research area is the assessment of environmental genotoxicity factor, which constitutes a significant parameter for evaluating the impact of all known and yet unknown toxicants.

Sustainable Management of Organic Materials with High Pesticide Content from Flower and Greenhouse Industry

Trine Eggen1*, Marit Almvik1, Rikard Pedersen1, Ove Bergheim1, Linn Solli1, Ksenia Gulyaeva1, Hege Bergheim1, Hanne Ugstad1, Hans Martin Hanslin1, Sven Roar Odenmarck1, Lina Aarsborg1, Marianne Stenrød1, Henrik Jagland2, Axel Wiig3

1NIBIO, Norwegian Institute of Bioeconomy Research, Norway, 2Mester Grønn, 3Axel Wiig Flower shop and Commercial horticulture

Abstract:

Every year, large quantities of floral and vegetable waste that may contain high levels of pesticide are produced from the flower industry1,2, and from vegetable production in the greenhouse industry if chemical treatment is necessary. In a project funded by the Norwegian Agricultural Authority, “Knowledge and measures for the treatment of waste containing pesticides and to reduce the spread of pesticides in the environment”, the goal was to achieve a sustainable management of waste materials containing high concentrations of pesticides and produce sustainable compost.

Non-target screening analysis of random samples provided a snapshot of mixed plant waste samples and selected species of cut flowers and potted plants. Around 130 different pesticides were detected in the samples, with around 50 different pesticides in a single sample; also some non-EU authorized pesticides. Optimization of the composting process of flower waste performed in several small-scale Dewar compost bottles (2 L) (primary based om temperature development), was followed by optimized composting (isolated 180 L boxes) of mixed plant waste. Even most of the pesticides were not detected after 95 days, appr. 15 pesticides, including a few metabolites, showed no or low removal. A Norwegian flower chain share results from the project to flower farms to make the production more sustainable. Anaerobic condition is known to be more efficient than aerobic condition for degradation of some pesticides3,4. Thus, a treatment concept can be a first phase of anaerobic treatment followed by an optimized composting process. The anaerobic treatment can be part of biogas production.

Assessment of Soil Composition and Radioactivity in Central Serbia: Mechanical, Chemical, and Elemental Analysis

Milena Zivkovic1*, Filip Grbovic2, Dragana Krstic1, Jelena Bogosavljevic3, Radmila Glisic2, Mohamed E.A. Aichouche4, Snezana Brankovic2

1University of Kragujevac, Faculty of Science, Department of physics, Kragujevac, Serbia
2University of Kragujevac, Faculty of Science, Department of biology and ecology, Kragujevac, Serbia
3University of Belgrade, Faculty of Agriculture, Belgrade, Serbia
4LMST, Civil Engineering Department, University of Science and Technology Mohamed Boudiaf, Oran, Algeria

Abstract:

This study investigates heavy metal contamination and both natural and artificial radioactivity levels in selected soil samples from various locations in Central Serbia. Key soil properties, including the concentrations of heavy metals such as lead, zinc, cadmium, iron, and chromium, were analyzed alongside radioactivity assessments. Mechanical and chemical analyses revealed significant variations in texture, acidity, and nutrient availability, which impact soil’s capacity to support plant growth and influence environmental management strategies. Elevated levels of heavy metals and radioactivity at certain locations raise concerns about contamination risks. The results showed that soil samples from locality Kopaonik had the highest radioactivity values for naturally occurring radionuclides 226Ra and 232Th, as well as the artificial radionuclide 137Cs, while 40K activity was highest at another investigated location. Across all samples, 40K showed the highest concentrations, with 226Ra exhibiting the lowest. Cesium-137 concentrations were notably higher in locality Kopaonik compared to locality Parcin. These findings contribute to a better understanding of soil contamination and inform sustainable land use and remediation efforts.

Biography:

Milena Zivkovic is a Research Associate at the Faculty of Science in Kragujevac, specializing in physics and the application of Monte Carlo simulations in medicine. Her work primarily focuses on the development of the FOTELP-VOX program (author R.Ilic), which is used for particle transport simulations in radiotherapy. In addition to her research, Milena mentors talented students and has been awarded multiple times for her science popularization projects. She is the author of numerous scientific papers, one of the authors of the monograph titled "Application of Monte Carlo Programs and Phantoms in Dosimetry," and a participant in numerous conferences. In 2023, she was named the best researcher at the Faculty of Sciences. Her contributions to the field have earned her membership in the German Physical Society.

Should Settleable Particulate Matter be Incorporated into Pollution Control Strategies?

Laura Megido[1]*, Rosa Lara[1], Beatriz Suarez-Pena[1], Luis Negral[2], Yolanda Fernandez-Nava[1], Jesus Rodriguez-Iglesias[1], Leonor Castrillon[1]

[1]University of Oviedo, Spain
[2]Technical University of Cartagena, Spain

Abstract:

Settleable particulate matter (SPM) impacts the environment and public health, yet often receives little attention.

In the western area of Gijon, Spain, SPM levels were notably high, particularly at an industrial suburban site reaching up to 4898 $mg \cdot m^2 \cdot d^{-1}$, far exceeding the Spanish legal limit in force until 2002. High SPM levels were also recorded at two urban industrial sites nearby, with maximums of 1039 $mg \cdot m^2 \cdot d^{-1}$ and 673 $mg \cdot m^2 \cdot d^{-1}$. Great reductions at these sites were observed —97.2%, 73.5%, and 90.5%, respectively during the COVID-19 lockdown period, when industrial activity and population mobility were reduced (Lara et al., 2022)

The human health risks posed by SPM may not be negligible due to the presence of elements, such as Pb and As, which can lead to both non-carcinogenic and carcinogenic effects (Lara et al., 2021).

Additionally, SPM can cause significant soiling and degradation of materials, impacting property use and societal activities. For example, in Great Vitoria, Brazil, even low deposition rates of 167 $mg \cdot m^2 \cdot d^{-1}$ caused annoyance to 17% of the population, with higher deposition rates increasing this probability (Machado et al., 2018).

Meteorological factors play a relevant role in SPM. Variations in wind patterns can considerably affect its dispersion and deposition, leading to higher concentrations in specific areas. Understanding these dynamics is essential for assessing SPM distribution and implementing effective pollution control measures.

Should future air quality policies address SPM emissions, especially in industrialized urban/suburban sites, to mitigate their environmental and health impacts?

Biography:

Laura Megido is an Industrial Engineer with an international Ph.D. in Chemical, Environmental, and Biofood Engineering from the University of Oviedo. Her thesis, "Particulate Matter in Ambient Air in Eastern Gijon: Levels, Composition, and Source Contribution," earned cum laude distinction and an Extraordinary Doctorate Prize in Engineering and Architecture. With eleven years of research experience in both public and private sectors, she coauthors over twenty scientific articles in prestigious journals. Her research publications predominantly explore topics in chemical and environmental engineering.

Rivers: Source of Energy and Preservation of Biodiversity, is this Possible?

Alba Ardura1*, Rodolfo Espina1, Aitor Fernandez Jiménez1, Victor Manuel Fernandez Pacheco2, Eduardo Alvarez1

1CUIDA (University Center for Water Research and Development), University of Oviedo, Spain
2Center for Industrial Diagnostics and Fluid Dynamics (CDIF), Polytechnic University of Catalonia (UPC), Avinguda Diagonal, 647, ETSEIB, Barcelona, 08028, Spain

Abstract:

Rivers provide a wide range of ecosystem services that are crucial for environmental health, human well-being and economic development. They supply water, food, materials and energy, as well as cultural and entertainment services. However, while they provide all these essential services, they face threats from pollution, dams and climate change. Spain is a country of contrasts when it comes to access to water, and the relationship between water and energy takes on special relevance due to its economic, social and cultural importance. Specifically in Spain, hydroelectric energy represents the 2nd renewable energy in terms of demand coverage, and 4th in the total energy mix, and it has interesting development prospects, especially regarding pumping stations, which are necessary to correctly integrate intermittent renewable energy into the country's renewable energy mix.

The efficient use of energy and water is essential to address the decarbonization of the economy to achieve the desired climate neutrality by 2050. In this context, the development of modern, clean water infrastructure minimizing impacts on ecosystem health will be key to driving economic growth while preserving the environment in the coming decades. Therefore, the main objective of this work is to carry out a review of the state of the art of Spanish rivers, from the point of view of energy supply and its effects on the ecosystem and its biodiversity. Being a starting point to propose alternatives for its efficient and sustainable use as an energy source, and the development of a fair energy transition.

Biography:

Doctor in Food Biotechnology. Associate Professor at the University of Oviedo. Keywords: genetics, environmental DNA, natural resources and citizen science. Research manager at the University Center for Water Research and Development (CUIDA). Expertise area in the use of molecular tools for the analysis of water health, traceability, early detection of invasive species, HTS analyses for bioindicators detections and development of species-specific markers for target species. Current projects: "Genetic tools and citizen science for the detection of SARS-Cov2 in environmental samples: fomites and water" (funded by the European Open Science Cloud). "Effects of global change on vulnerable diadromous species: salmon and eel in Europe" (funded by Spanish Science Ministry)".

Degradation of Organic Pollutants from Water Using a Cobalt Ferrite Catalyst

Maria del Pilar Fernandez Poyatos1*, Inmaculada Velo Gala2, Miguel Angel Alvarez Merino1, Maria Victoria Lopez Ramon1

1University of Jaen, Spain; 2University of Granada, Spain

Abstract:

Advanced oxidation processes (AOP) are an efficient way to degrade organic contaminants in water, based on the generation of radicals. In this work, a new AOP is presented in which a cobalt ferrite (CoFe2O4) was used as catalyst to activate peracetic acid (PAA) and generate radicals for the oxidative degradation of 2-phenoxyethanol (PE) from water. Cobalt ferrite solid nanoparticles were prepared by a hydrothermal method and calcined at 350°C and 800°C. Their chemical, morphological and structural properties were studied. It is shown that the calcination temperature of CoFe2O4 affect the average particle size, crystal growth, magnetic properties, and phase transitions. In this way, its BET surface decreases at higher calcination temperatures, so its catalytic activity is lower. The best catalyst for the degradation and oxidation

of PE is CoFe2O4 (without calcination). Results showed that 100% of PE (0.015 mM) was removed in CoFe2O4/PAA system by degradation within 90 min at 25°C at with a dose of 0.435 mM of PAA and 0.15 g L-1 of CoFe2O4. CH3C(O)O· and CH3C(O)OO· radicals were confirmed to be the key reactive species for PE degradation in the CoFe2O4/PAA system. CoFe2O4 showed excellent reusability during PAA activation by performing different catalytic cycles. This work provides a promising way to remove contaminants in wastewater treatment.

Biography:

Maraa del Pilar Fernandez Poyatos obtained her PhD in Chemistry in 2020 at the University of Jaen (Spain). She currently works as a Postdoctoral Researcher in the Department of Inorganic and Organic Chemistry in the research line “Elimination of organic and inorganic contaminants from water for its reuse in irrigation”. Her professional work has been focused on research activities whose final aims are the preservation of the environment by the study and characterization of pollutants and organic compounds in water and plants and focused on achieving comprehensive water treatment that allows its safe reuse for people and the environment.

Visible-light Photocatalytic Activation of Chlorine by Graphitic Carbon Nitride for Water Treatment

Inmaculada Velo-Gala1*, Andre Torres-Pinto2, Pilar Fernandez-Poyatos3, Claudia Gomes da Silva2, Adrian M.T. Silva2, Joaquim L. Faria2

1Granada University, Spain; 2Porto University, Portugal; 3Jaen University, Spain.

Abstract:

Water pollution, its growing request, and the global warming by climate changes threaten the sustainability on our planet. The actual European Regulation 2020/741 is focused on ensuring safe water reuse, with more restrictive limits for resistant microorganisms, disinfection by-products (DBP) and recalcitrant micropollutants (MP). It is well known that MP have been identified as a potential risk to aquatic and human life, thus becoming a highest environmental issue of concern. Despite the proven efficiency of the Advanced Oxidation Processes (AOP) for water recover at lab scale, only some traditional AOP, as the chlorination, are being used at full scale as tertiary treatment. Specifically, the challenge to apply chlorination safely in water reuse is the application of lower oxidants concentration to prevent DBP formation. In this study, it is achieved by the photocatalytic activation of chlorine using graphitic carbon nitride (GCN) under simulated solar radiation. The MP Acetaminophen (ACTP) was removed from water even in the presence of mineral salts, which enhanced its degradation through the formation of different radical oxidant species (ROS). The GCN photocatalyst improved its degradation in mineral water, boosting its removal efficiency when chlorine was added. The effect of different anions was studied, finding that this improvement was due to chloride and sulfate anions which generated new radicals as sulfate and chlorine species. Electrons and positive holes were photogenerated in the GCN that can react with water, oxygen, chlorine and anions, increase the mechanisms of ROS production and maintaining their concentrations along the degradation process.

Biography:

With 15 years of experience, the researcher career of Inmaculada Velo-Gala has been developed in different centres (Spanish institutions as the Instituto Nacional del Carbon (CSIC), the Catalan Water Research Institute, and the Jaen and Granada Universities; the Universidade do Porto in Portugal), being always related to the development of novel Advanced Oxidation Processes and catalytic materials for water treatment. Currently she is a permanent researcher at the Granada University, where she develops her own research line focused on the application of photocatalytic materials in combination with water electrooxidation reactions, for emerging contaminants removal and

Assessment of Groundwater Flooding Susceptibility and Hazard Through Machine Learning Techniques and Probability Modelling

Silvio Coda[1]*, Domenico Calcaterra[1], Delia Cusano[1], Pantaleone De Vita[1], Diego Di Martire[1], Mariano Di Napoli[2], Luigi Guerriero[1], Rita Tufano[1], Vincenzo Allocca[1]

[1]Department of Earth Sciences, Environment and Resources, University of Naples Federico II, Italy; [2]Department of Agricultural Sciences, University of Naples Federico II, Italy; [3]WhereTech S.r.l., Italy

Abstract:

Many areas worldwide are experiencing groundwater flooding (GF) events with serious impacts on the environment and human health. In Europe, this issue is addressed through Directive 2007/60/EC, which requires Member States to map GF hazards and risks and propose mitigation measures. This study presents two methodologies for assessing Groundwater Flooding Susceptibility (GFS) and Hazard (GFH). The GFS approach uses Spatial Distribution Models to link occurrence data with predisposing factors (PFs) and estimate their spatial distribution. Six PFs are considered, including hydrogeological, hydrographic, and land-use characteristics. A GF observation inventory provides the occurrence data. GFS results are generated using stand-alone models (GBM, ANN, MaxEnt), and their outcomes are ensembled through mean, median, and weighted-mean algorithms to reduce uncertainty. The ensemble model with the best predictive performance is selected for the final map. The GFH methodology is developed through a specific procedure that estimates i) the probability of GF events based on available groundwater level time series, and ii) probability mapping using a newly developed MATLAB™ code, groundwater table model, and high-resolution topographic data related to ground-level elevation and anthropogenic underground structures. Both methodologies have been tested and validated in a mixed-land use aquifer in southern Italy. Given the different types of input data and assumptions, these methodologies can be applied at various spatial scales. The GFS method is suitable for regional, basin, and sub-basin scales, while GFH is more appropriate for local scales. Both can serve as decision support tools for local authorities in GF risk management.

Biography:

Silvio Coda, PhD, is a researcher in hydrogeology at the Department of Earth Sciences, Environment and Resources of the University of Naples Federico II. His doctoral research focused on groundwater level rise in urban areas and its associated effects. Specifically, he studied ground deformations related to changes in piezometric levels and developed methodologies to assess groundwater flooding risk. His recent research includes estimating groundwater recharge in karst aquifers using field surveys and remote sensing data, as well as assessing natural background levels (NBL) in terrigenous aquifers.

Syngas Production Rich in H_2 from Steam Gasification of Agro-industrial Wastes, Integrated with CO_2 Capture by Concrete Wastes and Use of Potassium and Red Mud Catalysts

S. Panagiotidou* , D. Vamvuka, , A. Orfanoudaki, K. Zacheila

School of Mineral Resources Engineering, Technical University of Crete, 73100 Chania, Greece

Abstract:

Current work investigated the exploitation of some abundant and low cost waste materials for production of clean carriers rich in hydrogen, in line with low carbon and circular economy policies, promoting sustainable practices in biomass utilization and waste management. To enhance hydrogen yield and minimize carbon dioxide emissions, waste concrete fines, generated in huge quantities from construction activities, were used together with potassium carbonate and red mud waste from aluminum industry as novel carbon dioxide sorbent and catalysts, respectively. The study focused on the effects of sorbent/biomass ratio, type and catalyst loading, as well as temperature, on fuel conversion, product gas composition and heating value, syngas and hydrogen yield. Steam gasification experiments were conducted in a fixed bed unit and a thermogravimetric-mass spectrometry system. The amount of carbon dioxide captured between 700°C and

750°C at a Ca/C=1 was 82.6-91.9%. Under these conditions, the concentration of hydrogen in the product gas was increased by about 35%, achieving values 69.5% for the winery waste fuel and 59.6% for the sunflower waste, at 750°C. Red mud and potassium carbonate catalysts promoted the endothermic reactions and improved the conversion, which was raised up to 100% on a dry-ash-free basis. Potassium carbonate presented a better overall performance at a loading of 20% wt. At 750°C the molar fraction of hydrogen in the gas mixture ranged between 83.6% and 92.2% mol for the two fuels, whereas the higher heating value of gas and syngas yield varied between 12.6-13.6 MJ/m^3 and 3-3.6 m^3/kg, respectively.

Environmental Pollution in Brazil: X-Ray Fluorescence and Mass Spectrometry to go Beyond Heavy Metals, POPs in Fish and Bird Feathers and the Amazon Gold Rush.

Joao Paulo Machado Torres[1]*, Monica Santana Vianna[2], Gabriel Prohaska Bighetti[1], Wanderley Rodrigues Bastos[3], Petrus Magnus Amaral Galvao[4] and Claudia Candida Silva[5].

[1] Instituto de Biofísica UFRJ, [2]Sollytch Inc Ldt, [3]Universidade Federal Fluminense, [4] Universidade Federal de Rondônia and [5]Universidade do Estado do Amazonas, Brazil.

Abstract:

In Brazil, after the year 2000, the debate between the mainstream Economists and mixed colored Ecologists has created a very controversial and drastic situation of huge deforestation, helped by criminal mining dam collapses and fires to clear land that has created a dozen of mixed disasters with mega-pollution incidents. Some industrial scars of severe metallic and POP contamination do exist, making background studies sometimes almost impossible, when mineral ore exploitation exacerbated an overall scenario of environmental injustice. In this presentation some of the emblematic case studies are reported, using analytical results of biological tissues of different animal taxa as well as abiotic samples collected in the last years will be discussed. As a developing country, Brazil faces an immense challenge to control its sources of pollution specially at the Amazon that represents 60% of the country. To cope with decarbonization we will need huge financial and technical help from different national and international bodies, and there is still much to be done to reduce human exposure to several contaminants. Besides the prohibition of the use of mercury by goldminers, potential biotechnology approaches using plant extracts will also be described together with new strategies to make the control of pollution an innovative field.

Biography:

Joao P.M. Torres is a Brazilian biologist teaching and working in the field of environmental pollution since 1987. He is the head of the Environmental Health Program at the Instituto de Biofísica Carlos Chagas Filho (Universidade Federal do Rio de Janeiro). Member of the International Pesticide Association (IHPA) and of the International Panel of Chemical Pollution (IPCP).

Eco-genotoxicity and Oxidative Stress of Polystyrene, Acyclovir and Imidacloprid in Ceriodaphnia dubia

Elena Orlo*, Roberta Nugnes, Chiara Russo, Angela Di Matteo, Margherita Lavorgna, Marina Isidori

Department of Environmental, Biological and Pharmaceutical Sciences and Technologies, University of Campania "Luigi Vanvitelli", Via Vivaldi 43, 81100 Caserta, Italy

Abstract:

Freshwater ecosystems represent the primary acceptor of treated wastewater, which generally retain several classes of chemical pollutants due to the inadequacy of conventional treatment plants, thus becoming a reservoir of anthropogenic pollutants. This work analyses the acute, chronic, genotoxic effects and the

oxidative stress of three pollutants, the microplastic particles of polystyrene (PS-MPs, size 1.0 µm), the drug acyclovir (ACV) and the pesticide imidacloprid (IMD), found in surface water in the order of units of ng/L to tens of µg/L, in the crustacean Ceriodaphnia dubia. This organism is usually used as sentinel species for its sensitivity to xenobiotics, genetic uniformity and worldwide distribution. The median lethal effect, investigated in the acute toxicity, occurred at concentrations of PS-MPs and IMD in the order of tens of mg/L, while higher than hundreds of mg/L of ACV. Chronic exposure of the crustacean for 7 days to the selected xenobiotics highlighted the median inhibition of reproduction in the order of thousands of µg/L of PS-MPs and IMD and definitely lower (hundredths of µg/L) of ACV. The DNA damage caused after 24 h of in vivo exposure of C. dubia to PS-MPs and IMD was significant at units of µg/L, while the same effect was at hundreds of µg/L of ACV. At the same concentrations, oxidative stress was induced by PS-MPs and ACV, with a percentage of about 20%. These findings highlight that the selected pollutants represent an issue of environmental concern.

Biography:

PhD in environmental, design and innovation since July 2022. Research fellow at University of Campania "Luigi Vanvitelli" since March 2024. The principal fields of research are focused on environmental toxicology and risk assessment of pollutants in freshwater and marine organisms, and the ecotoxicological impact of municipal and hospital wastewater before and after conventional and innovative treatments in WWTPs.

Combination of Polystyrene Microplastic Particles with Pesticides and Antiviral Drugs: Eco-genotoxity in Ceriodaphnia dubia

Chiara Russo1 *, Roberta Nugnes1, Elena Orlo1, Angela di Matteo1, Margherita Lavorgna1, Michael Kundi2, Marina Isidori1

1Dipartimento di Scienze e Tecnologie Ambientali, Biologiche e Farmaceutiche, Universita della Campania 'L. Vanvitelli', Italy; 2Medical University of Vienna, Center for Public Health, Department of Environmental Health, Austria

Abstract:

Microplastics, by absorbing and transporting other pollutants, play a key role in the "Trojan horse" effect in zooplankton species because they are unable to distinguish microparticles from phytoplankton during normal feeding and swimming activities. Polystyrene is one of the most widely produced plastics on a global scale and it is among the most abundant microplastic particles found in freshwaters. To date, few studies have focused on the eco-genotoxic effects in freshwater organisms caused by polystyrene microplastic particles (PS-MPs) in combination with other pollutants such as pharmaceuticals and pesticides.

The purpose of this study was to investigate chronic and genotoxic effects of the microplastic polystyrene beads (1.0 µm) in combination with the antiviral drug acyclovir (ACV), and the neonicotinoid broad-spectrum insecticide imidacloprid (IMD) in one of the most sensitive non-target organisms of the freshwater food chain: the cladoceran crustacean *Ceriodaphnia dubia*. Bliss independence was used as reference model for this research because of the different modes of action and/or different biological sites of the individual drugs.

When *C. dubia* neonates were exposed for 24 h to the mixtures, mostly an antagonistic genotoxic effect was observed by using Comet assay, while when the organisms were exposed to the mixtures for 7 days, mostly an additive inhibition of reproduction occurred. The eco-genotoxic assessed risk is of environmental concern.

Biography:

Tenure-track assistant professors in environmental hygiene and environmental toxicology since September 2022 at University of Campania "Luigi Vanvitelli", Italy. The principal fields of research are focused on the ecogenotoxic effects of xenobiotics in aquatic organisms, the environmental risk assessment, the environmental impact of hospital and municipal wastewaters. Scopus ID: 56677930200; ORCID: 0000-0001-6026-1059.

Considering the Stereoisomerism of Chiral Herbicides in the Environment. Profoxydim Case Study

Pilar Sandin-Espana*, Alvaro Cervantes-Diaz, Miguelina Mateo-Miranda and Jose Luis Alonso-Prados

Plant Protection Products Unit / Plant Protection Department, National Institute for Agricultural and Food Research and Technology INIA-CSIC, Ctra. La Coruna, Km. 7.5, 28040 Madrid, Spain

Abstract:

Knowledge about chirality is very important since enantiomers of chiral pesticides can differ significantly in their environmental fate when interacting with other chiral molecules, such as enzymes and of microorganisms present, for instance, in water or soils. However, the majority of studies on chiral pesticides do not explicitly account for individual stereoisomers. Therefore, current knowledge of these chiral pollutants is often inaccurate, as it incorrectly assumes that stereoisomers have identical environmental behavior.

Profoxydim is a post-emergence herbicide used to control weeds in rice. Its chemical structure has two chiral centers, resulting in four diastereoisomers. The aim of the present study was to develop a highly sensitive and efficient analytical method, optimizing extraction and chiral HPLC, for the detection of trace residues of profoxydim isomers and to study the degradation of each of the four isolated stereoisomers in paddy soil and the identification of the degradation products formed.

The method was validated and found to have good accuracy and precision, with recoveries ranging from 88.27 to 106.53 for soil. The limit of detection for the profoxydim isomers was 10.8 µg/kg, and the limit of quantification was 25 µg/kg. Furthermore, the proposed method was employed for the first time to investigate the individual degradation of novel isolated stereoisomers of profoxydim in soil and the kinetics and evolution of the generated degradation products (DPs). The degradation of the four stereoisomers followed first-order kinetics and was found to be stereoselective, with half-lives ranging from 14.7 and 19.5 hours.

Biography:

Pilar Sandin-Espana has been a researcher in the Plant Protection Products Unit at INIA-CSIC since 2016. She holds a degree and a PhD in Chemical Sciences. She is in charge of the Chemical Research Group of the Plant Protection Products Unit of INIA-CSIC. Her main research lines are focused on the chemical behavior of pesticides and their transformation products in the environment, the study of chiral compounds and the development of analytical methods for the analysis of pesticide residues in water, soil and plants. She has participated in 18 competitive research projects. She has published numerous scientific articles and book chapters and participated in more than 40 conferences.

Urban Climate: How it can Boost the Development of Sustainable Cities?

Natasha Picone*

IGEHCS – CONICET/UNCPBA, Argentina

Abstract:

Urban climate is the modification at local or microclimatic scale of meteorological parameters made by cities. It´s importance lies in how this modification impact on daily life but also how can be improved to generate better conditions for people to live in cities. In this sense, this fields can improve the sustainable approach for the development or improvement of urban areas.

This work present different analysis of urban climate in Tandil, an intermediate city of Argentina and how they can be used in urban planning to enhance the sustainable development of the city. Several methodologies have been applied: field measurements of air temperature, humidity, precipitation, and thermal comfortability; remote sensing studies related to urban form, vegetation, and surface temperature; and models of how the changes in urban form can change the results in urban energy budgets.

The results have shown that the urban form and green spaces distribution have a great impact in the distribution of meteorological parameters, but also some other aspects as topographic difference or regional patterns have impacts. Regarding the future scenarios, the compact or disperse model change completely the demand of energy in future so this should be considered for urban planning.

These results are key to developing the sustainability in cities. The associations found can improve the understanding of the urban system. At the same time, they can be used as key patterns to be reproduced or avoid in the future to generate inclusive, resilient, and livable cities.

Biography:

Geographer (UNCPBA, Argentina) with a master's in urban climate and sustainability (EMMJP – GCU, Scotland; LAB Applied Sciences, Finland; HTW, Germany and UHU, Spain) and a Geography PhD (UNS, Argentina). Currently I am a Research Assistant in IGEHCS (CONICET/UNCPBA, Argentina) with a research focus on urban climate and geographical information technics applications to the urban sustainable development of intermediate cities.

Large-scale Biomonitoring of Multiple Contaminants in Atmospheric Deposition in Eastern Canada

Jean-Philippe Bellenger [1]*, Daniel Houle[2], Laurie Michel[1], Shaghayegh Ramezani[1]

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Abstract:

In Canada, programs for the monitoring of atmospheric depositions are scarce. The Canadian air and precipitation monitoring network (CAPMoN) operated by Environment and Climate Change Canada, is a valuable pancanadian tool but it is limited in scope (contaminants included) and geographic coverage (number of sampling stations). Computer models are valuable tools for producing predictive maps of deposition, but they strongly rely on the quality of field data (sampling grid and frequency). Programs monitoring atmospheric deposition at a large scale, using biomonitors such as moss and lichens, are valuable tools to fill the gaps between monitoring stations. Biomonitoring programs are common in Europe, where they cover a wide array of contaminants and are updated regularly (a few years). In Canada, large-scale biomonitoring initiatives are scarce to non-existent.

Here, I will present initial results from a large-scale biomonitoring initiative started in 2022 in Eastern Canada (Province of Quebec). This provincial initiative is complementary to the pan-Canadian biomonitoring program Bryomonitoring. This project aims to map at high spatial resolution the atmospheric deposition of traditional and emerging contaminants, including but not limited to PAH, pesticides, antiozonants, rare earth elements, and mercury.

Biography:

Jean-Philippe Bellenger is a full professor at the Department of Chemistry at the Universite de Sherbrooke, QC, Canada. His multidisciplinary research focuses on the fate and impact of inorganic and organic contaminants in the environment. His group has developed numerous methods for the analysis of contaminants in a complex matrix that supports multidisciplinary collaborative research on the effect of contaminants on environmental quality and the health of wildlife and children. His research has been published in the most respected journals in his field (e.g., Nature Communications, PNAS, Environmental Science and Technology, Metabolomics, New Phytologist).

Territorial Studies of the Mayan Milpa

Maria Elena Mendez-Lopez1, Karla Juliana Rodriguez Robayo2, Lilian Juarez-Tellez3.

1 Center for Research in Geoespatial Information Science- CONAHCYT, México. 2 Agrosavia, Colombia. 3 Independent research.

Abstract:

The Mayan milpa is an ancestral agri-food system mainly comprised of the triad of maize, beans and squash. Although the milpa system is still used in almost all of Mexico, the milpa made in the Yucatan Peninsula has specific elements that adapt to complicated climatic and edaphic conditions. The production of the milpa requires a deep knowledge of the ecosystem dynamics in which it is created, the tropical forest. Milpa depends on the rainfall cycle to persist and retains a crucial genetic diversity of edible products. Many families continue to base their diet on the milpa; however, many climatic, cultural and political factors have affected the sustainability of this food system and, with it, the food security and sovereignty of the rural environment.

In this study, we interviewed small farmers and academics who are experts in the milpa system of the Yucatan Peninsula. On the other hand, we reviewed more than 200 documents, such as articles, theses and books, to understand the main problems faced by a system in danger of disappearing. The main challenges faced by the Mayan milpa are climate change, extractive production and public policies that reduce the availability of land for its development, migration, and the loss of traditional knowledge transmitted from generation to generation.

Biography:

Maria Elena Mendez-Lopez, Biologist from the Michoacan University San Nicolas de Hidalgo. PhD in Environmental Sciences from the Autonomous University of Barcelona. Researcher at the Center for Research in Geospatial Information Sciences. Her main lines of research are agrarian systems with a socio-ecological approach. In recent years, her research has been focused on the analysis of socio-ecological systems and socio-environmental conflict.

Review of Framework Development: Vulnerability of Unhoused Populations to Climate Change in the United States

Harris Eisenhardt*[1,2], Thomas Peterson[1,2], Michael Schwebel[2]

[1]Center for Climate Strategies; [2]Johns Hopkins University

Abstract:

The interactions between climate change and homelessness in the United States are neither widely documented nor uniformly quantified. Individuals who experience homelessness are commonly not accounted for in community, state, or federal climate change adaptation planning or vulnerability assessment frameworks. Drawing on established vulnerability assessment publications, this review and analysis presents a standard approach to evaluate the climate vulnerability of an unhoused population, modeled at U.S. census tract granularity. The methodology features recommended steps to leverage modeling-, survey-, and evaluation-based indicators to measure exposure, sensitivity, and adaptive capacity to determine vulnerability of an unhoused population to relevant climate impact drivers. Standardizing a vulnerability assessment methodology that prioritizes unhoused populations can facilitate new opportunities for data compilation, enabling assessment practitioners to highlight urgent vulnerability gaps and undertake targeted interventions to improve resilience within an unhoused population. This work reviews the author's recent publication in the Journal of Climate Risk Management, and the research process to develop the framework.

Biography:

Harris Eisenhardt is an interdisciplinary researcher currently focusing on the interactions between unhoused populations and climate impact drivers. He holds a Bachelor of Science in Sustainable Energy Management from the State University of New York College of Environmental Science and Forestry, and a Master of Science in Energy Policy and Climate from Johns Hopkins University.

Heterogenous Semiconductor Photocatalysis for Wastewater Treatment

Saima Farooq[1*], Asima Siddiqa[2], Marium Mushtaq[3], Shabnam Shahida[3], Mohammed Al Sibani[1]

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[2]Nanosciences and Technology Department, National Centre for Physics, Islamabad, 44000, Pakistan
[3]Department of Chemistry, University of Poonch Rawalakot, Azad Kashmir, Pakistan

Abstract:

Heterogeneous semiconductor photocatalysis presents a sustainable avenue to improve water quality and contribute to achieving Sustainable Development Goal (SDG) 6 by effectively addressing environmental remediation challenges. Advanced oxidation processes (AOPs), especially photocatalysis have tremendous potential in wastewater treatment. Dye-contaminated wastewater is not only polluting the environment but causes serious health risks to both human and aquatic biota. This necessitates the development of efficient methods to remove dyes from contaminated effluents before their release in the environment. Titanium dioxide is the most widely used catalyst for the dye's degradation in photocatalysis due to its low cost, thermal stability, chemical stability, huge surface area and non-toxicity. The present work reports a one-pot synthesis of non-metal/transition metal co-doped TiO_2 nanocomposites for photocatalytic degradation of reactive azo dye from aqueous solution. Various derivatives of TiO_2 nano photocatalysts as $S@TiO_2$ (singly-doped), and $Mn/S@TiO_2$ (co-doped) with different weight percent were successfully synthesized and analyzed for detailed material characterization. The results revealed that S/Mn co-doped TiO_2 nanocomposite exhibited high surface area, large pore volume and enhanced optical properties than undoped and S-doped TiO_2. Furthermore, the photoactivity of TiO_2 nanoparticles was tested for Reactive Blue photocatalytic degradation. The co-doped nanocomposites ($Mn/S@TiO_2$) manifested remarkable photocatalytic activity for the degradation of Reactive Blue dye under visible-light irradiation. The optimum degradation efficiency attained for reactive blue with $Mn/S@TiO_2$ nanocomposites was 92% in a short time of ~70 min. The significant degradation values and kinetic rate constant values strongly suggested that co-doped TiO_2 degraded Reactive Blue at a higher rate than did undoped and S-doped TiO_2. In addition, $Mn/S@TiO_2$ catalyst can be effectively employed for the degradation of emerging contaminants from industrial wastewater.

Biography:

Saima Farooq has been working as Assistant and then Associate professor of Physical Chemistry at the University of Nizwa, Oman, since 2013. She received her PhD degree in Physical Chemistry at the Quaid-i-Azam University, Pakistan in 2012 and did short-term post doctorate supervised by Prof. Chedly Tizaoui in 2019 at the Water and Resources Recovery Research Laboratory, Swansea University, UK. She has published more than 40 research articles in SCI(E) journals, 7 book chapters with total citations 1027; h-index 17. Her research interests are adsorption, heterogenous catalysis, advanced oxidation processes, and wastewater treatment.

Development of Nanofertilizers Based on Natural Zeolite for the Reduction in the Use of Conventional Fertilizers

Belkys Polo Cambronell[1*], Julian Botero Londono[2], Rogelio Ospina Ospina[1,3]

[1]Universidad Industrial de Santander, Centro de Investigaciones en Catalisis -CICAT, Colombia, [2]Instituto de Proyeccion Regional y Educacion a Distancia – IPRED, Universidad Industrial de Santander, Colombia;
[3]Ciencia de Materiales Biologicos y Semiconductores -CIMBIOS, Universidad Industrial de Santander, Colombia.

Abstract:

The widespread use of conventional fertilizers has been associated with negative environmental impacts, raising the need to explore more sustainable alternatives[1]. Although biofertilizers represent a promising option, their application is still in an incipient stage and limited in production scale, which fails to satisfy the growing food demand derived from population growth. In this context, it is imperative to develop more efficient and environmentally friendly fertilization techniques and mechanisms[2]. A promising strategy is the

development of nanofertilizers through the use of natural zeolite, used as a gradual and controlled release system, which allows reducing both the amount of fertilizers needed and their environmental impact, while improving both the quantity and the quality of the biomass produced[3]. These measures are crucial to ensure food security and promote long-term sustainability in agriculture. In the experimental development of this work, natural zeolite was used that was reduced to a nanometric scale by planetary grinding, and was characterized using FTIR, SEM-EDS, XRD, TGA, atomic absorption, LDS techniques; for chemical, structural, morphological, and chemical analyzes of the developed nanofertilizers.

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