# The Scientistt
Exploring Science • Promoting Innovation

# EnScience2023

2nd Global Summit on Environmental Science and Applications

**May 25-26, 2023**     **Brussels, Belgium**

## The Scientistt

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# FOREWORD

**Dear Colleagues,**

It is a great pleasure to announce that The Scientistt will host the 2nd Global Summit on Environmental Science and Applications (EnScience2023) will be held in Brussels, Belgium during May 25-26, 2023.

EnScience2023 aims to bring together the renowned researchers, scientists and scholars to exchange ideas, to present sophisticated research works and to discuss hot topics in the field and share their experiences on all aspects of Environmental Science and Applications.

The EnScience2023 will be a 2 days event that means to gather the key players of the Environmental Science and Applications community and related sectors. This event is launched with the aims to become an established event, attracting global participants, intent on sharing, exchanging and exploring new avenues of environmental science and applications -related scientific and commercial developments.

A wide-ranging scientific program consisting of plenary lectures, keynote lectures, Invited lectures, parallel sessions, as well as poster sessions for young scientists covering all topics in environmental science and applications will be scheduled. This conference provides a wonderful opportunity for you to enhance your knowledge about the newest interdisciplinary approaches in Environmental Science and Applications.

Moreover, the conference offers a valuable platform to create new contacts in the field of Environmental Science and Applications, by providing valuable networking time for you to meet great personnel in the field.

We look forward to seeing you at EnScience2023 in Brussels, Belgium

# COMMITTEES

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| | |
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# Plenary Forum
# Day-1

## Dai-Yeun Jeong
Director, Asia Climate Change Education Center
226 Songi-gil, Jeju-si, Jeju Special Self-Governing Province, South Korea.

# A Desirable Framework for Establishing Climate Change Policy

## Abstract
There are four major agents responding to climate change at a national or local level. They are government, enterprises, citizens and civil organizations. Government responds to climate change by establishing policies, enterprises by green management for reducing ecological cost in the process of producing and distributing goods and services, citizens by eco-friendly behavior in everyday life, and civil organizations by environmental movement. Among these responses by agents, this paper aims at presenting a desirable framework worth considering when government establishes climate change policy. In order to achieve the objective, this paper will be composed of three parts as below.

Part 1: There are similar and inter-related, but different terminologies in relation to policy. They are strategy, policy, and measure, etc. As an introductory part, the concepts and inter-related implications of these terminologies will be reviewed in order to understand more clearly what policy is.
Part 2: As the main content of this paper, a desirable framework for establishing climate change policy will be presented, following the four steps as below.
Step 1: Climate change policy is a strategy against vulnerable sectors to climate change. Therefore, how to identify the vulnerable sectors to climate change should be the first step for establishing a desirable framework.
Step 2: Climate change policy should be established by vulnerable sector, but all vulnerable sectors identified from Step 1 can't be the target of policy formation due to limitation of financial availability when implementing the policy. In this context, how to select the prior vulnerable sectors/how to set up the goal of policy/how to mobilize the means to achieve the goal will be presented.
Step 3: The policy that is not based on a social consensus among social organizations such as NGOs, citizens and stakeholders, etc. causes a social conflict when the policy is implemented. Therefore, the introduction of governance is necessary in the process of policy-making in order to absorb the social conflict in advance. In this context, what type of governance would be desirable will be presented.
Step 4: Most national and local governments are faced with the limitation of financial availability required for implementing the policies. This is the major cause to select limited number of policies to be launched among all policies established. Therefore, it is necessary to decide policy priority to be launched in terms of policy effect and amount of financial investment for each policy. In this context, the methodology of policy effect analysis will be presented. Two phases of policy effect analysis will be presented. One is efficiency analysis of financial investment, and the other is effect analysis of all policies as a whole set.
Part 3: As the concluding remarks, what capacity should be built will be discussed for government to implement successfully climate change policies. This is because there are many external factors determining the successful implementation of climate change policies.

## Keywords

Policy, Climate Change, Vulnerability to Climate Change, Governance, Policy Effect Analysis, Capacity Building

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## Biography

Dr. Dai-Yeun Jeong is presently the Director of Asia Climate Change Education Center and an emeritus professor of environmental sociology at Jeju National University in South Korea. He received BA and MA degree in sociology from Korea University (South Korea), and PhD in environmental sociology from University of Queensland (Australia).He was a Prof. of environmental sociology at Jeju National University (South Korea) from 1981 to 2012. His past major professional activities include a teaching professor at University of Sheffield in UK, the president of Asia-Pacific Sociological Association, a delegate of South Korean Government to UNFCCC and OECD environmental meeting, a member of Presidential Commission on Sustainable Development Republic of Korea, and a Research Associate at Environmental Policy Committee for Sustainable Development, The National Assembly of Republic of Korea, etc. He has published 60 environment-related research papers in domestic and international journals and 13 books including Environmental Sociology. He has conducted 100 unpublished environment-related research projects funded by domestic and international organizations.

# EnScience2023

**The Scientistt** — Exploring Science · Promoting Innovation

## 2nd Global Summit on Environmental Science and Applications
### May 25-26, 2023 | Brussels, Belgium

## Rob Kirby

R Kirby , BSc, PhD, DD of NE from ASCE Senior Visiting Fellow (rtd) National Oceanography Centre, Liverpool; Ravensrodd Consultants Ltd

## Severn Tidal Power Barrage-Using past experience to Steer the Future

### Abstract

Every country is struggling with the challenge of combatting climate change. The Severn Estuary, separating Wales from England, has a Highest Astronomical Tide range of 14.7m. Over recent decades UK has reconsidered more than once the prospect of building a tidal power barrage extending between Weston-Super-Mare in the south & Lavernock Point in the north. Such a modular structure would be 15.9 km in length & be equipped with 216 tidal turbines each of 9.0 m in diameter. The enclosed basin would have an area of 480 km$^2$ . Such a structure represents the biggest & best tidal power prospect in the world. It would generate a minimum of 7% of the current electricity need of England & Wales, though with new cutting-edge technologies, this output can be expected to be significantly greater. Most recent estimates itemise an installed capacity of 8640 MW & an annual output of 17,000 Million kWhr (17 TWhr). It involves neither a fuel cost nor does it generate a waste. It would have a lifespan of many centuries & act as a sea defence as well as a communication link. Over the last 50 years academics have homed-in on deterministic aspects of the physical & chemical regimes of this estuary, leading to the all-pervasive control these exert on "ecosystems".
Furthermore, multi-decadal monitoring of environmental drivers, coupled with attribute response to these, are now available & will be shown. Very robust understanding starting in the early 1960's highlights two key attributes not routinely enjoying prominence. The first hinges upon origins of what is termed "Environmental Science?"  The second focusses on the rigour with which science is is applied:- otherwise-classicaleroding foreshores here lack a key feature! What is it? Why?
The presentation will address other issues. The first is the now-resolved bitter conflict between proper science & "conservation"-a confrontation "of our time". It will be shown that unimpeachable science triumphs in the end. The second will examine the engineering of how such a scheme might now be configured, touching on the newly emerging low-head tidal turbines, parallel "green hydrogen" generation, coupled with prospects for synergies between nuclear power & these tidal technologies. Unlike wind & solar, tidal technologies have the major benefit of being infinately predictable. With these new emerging add-on technologies we might just make the power continuously available.
Succeeding generations will expect nothing less from us that we get an optimal handle on the environmental science, together with maximising output from the most efficient & imaginative scheme.

### Biography

The main progress has been in the discovery of oceanographic phenomena new to science and an increased understanding of the behavior of sediments. These advances have been based on field using new instruments and techniques developed by myself in conjunction with others. These new concepts have been successfully applied to various engineering problems.

In the port engineering field, Dr Kirby, accompanied by a small number of very expert colleagues, has developed and brought to commercial fruition two new Sediment Management Systems. He is the co-inventor of the NAUTICAL DEPTH concept, as well as the continuous vertical gamma-transmissance, and later, towed undulating (NAVITRACKER) profilers with which to measure this. Nautical depth is a concept applicable to fairway maintenance in high turbidity (fluid mud) systems. This initial concept must now be termed PASSIVE NAUTICAL DEPTH. It has been evaluated, ratified and promulgated world-wide by PIANC. Where applicable, for example, at Rotterdam/ Europort (Holland), Zeebrugge (Belgium) and elsewhere it has resulted in major cost saving. In a new iteration, Dr Kirby has provided part of the science underpinning ACTIVE NAUTICAL DEPTH, a method to further minimise maintenance dredging need and at the same time use the fluid mud cloud to decontaminate the sediment in situ.

The prototype port for this is Emden in Germany. Dr Kirby is also the co-developer of a revolutionary patented technique for reducing eddy-induced siltation in the entrance to blind-ending basins in lower turbidity regimes. These ENTRANCE FLOW OPTIMISATION SYSTEMS (EFOS) involve SILLS and CURRENT DEFLECTING WALLS and, from European Union-funded generic research contracts and practical experience in tidal situations, have been found to reduce sediment input from all three of the principal mechanisms.

Creation of a design protocol for these systems has also required development of dedicated design technologies, which themselves have a wider application outside the immediate port engineering field. There is now years of practical experience with these systems at the prototype test site, Hamburg in Germany. Their use is now spreading in the port industry, with further systems envisaged for Hamburg as well as for Antwerp and potentially Rotterdam/Europort, three of the top ten ports in the world. They also contribute in a major way to an important change in modern port design, namely replacing impounded with tidal basins at high tidal range and turbid ports, a trend arising from competitive pressure from the container shipping trade. Benefits from these systems span a broad spectrum of economic and environmental issues and involve extremely large sums of money.

Dr Kirby is a shareholder and director in Balticon International, a company using new types of highly mobile recycling plants to decontaminate waste terrestrial and marine mineral material. Following separation, a range of disposal options can be applied to the concentrated contaminants, whilst the primary minerals produced find a wide range of beneficial uses, for example in habitat creation or in manufactured products. This latter activity complements the two Sediment Management Systems.
In the coastal engineering field, Dr Kirby is the inventor of a patented self-sustaining soft sediment coast protection methodology, TIDAL FLAT REGENERATION, which involves placing wave attenuators and muddy dredge material to alter whole mudshore cross-sectional profiles from low and concave, to high and convex shapes. Similarly he is the co-developer of a "top down model" or mudcoast management system, S-FACTOR ANALYSIS, which permits shore stability and erosion-potential to be quantified for the first time. Dr Kirby has proposed the MEHBY RULE as a conceptual model for mudshores to stand alongside the accepted Bruun Rule for sandy shores. This encompasses and explains in summary form the contrasted behaviour of muddy and sandy foreshore.
Dr Kirby was Chairman of the PIANC MarCom Working Group 43 "MINIMISING HARBOUR SILTATION" (MHS) which sought to evaluate and promote generic Sediment Management Systems around the world. The report was published in October 2008.

## Yankai Xia

### Yankai Xia[1,2*], MinjianChen[1,2], Hongcheng Wei[1,2], Beibei Gao[1,2]

[1]State Key Laboratory of Reproductive Medicine, School of Public Health, Nanjing Medical University, Nanjing, China.

[2]Key Laboratory of Modern Toxicology of Ministry of Education, School of Public Health, Nanjing Medical University, Nanjing, China.

# Comprehensive Environmental Exposure and Reproductive Health: A Global Perspective

## Abstract

Backgrounds: Recently, with the accelerating process of industrialization, the natural and social environment are also undergoing drastic changes. The resulting adverse environmental factors have become an important risk factor threatening the health of people around the world  As the core content of population development strategy, reproductive health has been widely concerned.

Objectives: Trying to assessing environmental and health from a global perspective (comprehensive assessment, reliable extrapolation, extensive exploration of causes).

Method: 1.Higher quality of exposure assessment from design to practice: I. Standardized sample and data acquisition; II. Systematic and scientific cohort management; III. Reliable exposure group analysis platform; IV. Use models and methods for comprehensive evaluation2. Assessment of health effects of environmental exposures: I. Identification of important mixture components; II. Global assessment and regional comparison;  III. Nonmonotonicity in exposure-response relationships.

Results: 1. Different designs (Randomized controlled trial, Cohort study, Case control study, Case reports) exhibit different statistical power; 2. Cohorts provide the opportunity to assess the consequences of exposures occurring at different moments in the life cycle, allowing the identification of critical periods in which a given exposure will program reproductive health in the long term; 3. Achieved the Standard Operating Procedure (SOP) for Quality control, Cohort Management, Data management, Sample storage and management. 4. A stable and reliable internal exposure analysis platform has been established and global comparison studies have been conducted based on high-level quality control (Comparability). 5.  Comprehensive evaluation of environmental exposure in regionally and globally had been conducted using diverse statistical models and AI by combining the Exposome and Multi-omic analyses.

## Keywords

Global perspective; Cohort study; Reproductive health; Environmental exposure;  Exposome; Multi-omic analyses.

## Biography

Prof. Yankai Xia is the Vice President of Nanjing Medical University and professor of Toxicology at School of Public Health. He works on environmental exposure and reproductive health. He has been in charge of several National or International projects. He has published more than 280 peer-reviewed articles with H-index of 49.He also owns 12 authorized national patents and have been awarded the Second Prize of National Scientific and Technological Progress and other prizes. He

was also the committee members of the International Society of Exposure Science (ISES), Birth Cohort Consortium of Asia (BiCCA) and several Chinese academic committees. He also acts as Editor/Associate Editor of several distinguished journals in the environmental field.

## Eric Wolanski

Eric Wolanski,  PhD, FTSE, DSc Hon.Causa (Hull & Louvain), Membre Correspondent de l'ARSOM

# The physics behind the biophysical oceanography of the Great Barrier Reef

## Abstract

Here we emphasise a fundamental difference between shelf waters of the Great Barrier Reef (GBR) and other parts of the world.  The water circulation over the GBR continental shelf, like that of continental shelves worldwide, is strongly influenced by the circulation in the adjoining sea. This circulation is dominated by the South Equatorial Current that is highly mesoscale turbulent and takes the form of jets and eddies. As these jets approach the continental shelf, they bifurcate to the north and south. Commonly shelf waters have a gentle slope, with few shoals, islands and reefs until the shelf break. In contrast, the GBR has about 2,500 reefs, resulting in a flow field largely uncorrelated with the mesoscale turbulence in the adjoining Coral Sea.  The currents among reefs are generally dominated by strong tidal currents, topographic eddies, jets, topographically-driven upwelling and downwelling, shear zones, stagnation zones, and topographically steered flows. The reefs generate a "bioengineered" physical oceanography dominated by a number of processes including (1) Bernoulli tidal upwelling in reef passages, (2) inflow of oceanic water from wave breaking at the reef crests, (3) swift tidal flow through reef passages and the channelisation of the tidal flow on the shelf, (4) the wind deflecting intruding oceanic water back out to sea, (5)  deflection of the mean currents around a reef matrix by the "sticky water" effect, (6) convergence of opposing tidal waves in the southern GBR, (7) reduction by the reefs of the inflow into the GBR from oceanic water.

## Biography

Professor Eric Wolanski is an oceanographer and ecohydrologist at James Cook University, Australia. His research interests range from the oceanography of coral reefs, mangroves and muddy estuaries, to the interaction between physical and biological processes determining ecosystem health in tropical waters. He has 420 publications, including 12 books. His h-index is 83 and he has 23,421 citations. Eric is a fellow of the Australian Academy of Technological Sciences and Engineering, the Institution of Engineers Australia (ret.), and l'Académie Royale des Sciences d'Outre-Mer (Belgium). He was awarded a Doctorate Honoris Causa by the catholic University of Louvain, another Doctorate Honoris Causa by the University of Hull, a Lifetime Achievement Award by the Estuarine & Coastal Sciences Association, and a Queensland Information Technology and Telecommunications Award for Excellence. Eric is an Editor-in-Chief of Wetlands Ecology and Management, and the Elsevier book series "Ecohydrology from catchment to coast".

# Patricia M. Glibert

University of Maryland Center for Environmental Science, USA

# The Challenge of Multiple Stressors in Aquatic Systems

## Abstract

Human activities on land are changing aquatic environments in diverse and complex ways with important implications for ecosystems. For many aquatic systems, nutrient pollution leads to eutrophication, temperatures are increasing, carbon dioxide ($CO_2$) is increasing and pH is decreasing. These factors have contributed to increasing hypoxia and harmful algal blooms (HABs), which themselves have become stressors and have altered the community of organisms that compete and interact to structure food webs. Rising $CO_2$ levels are also altering natural waters in complex ways. Oceans are acidifying, leading to negative effects on growth of calcifying organisms, but also changing primary productivity in many regions. As a consequence, ecosystem changes are occurring rapidly and in nonlinear ways, and complexity results from the interactions between these multiple stressors. Classic conceptual relationships regarding stressors and effects (dose-response functions) and future projections based on single-factor responses have limited utility given the multitude of changes occurring now and in the future.

The nutrients that support eutrophication are derived from human and animal waste, fertilizer runoff, from changes in flow to receiving water bodies (such as from river damming), and atmospheric changes and inputs. Due to eutrophication, it has been estimated that the oceans have lost 2% of their oxygen over the past decades, and areas that are hypoxic or anoxic have increased four-fold. Altered nutrient applications to land, increased animal (including aquaculture) production, and hydrological changes in flow have modified nutrients that are available to primary producers in form and quantity, leading to increasing frequency and geographic extent of HABs in both marine and freshwaters. HABs either contaminate seafood with toxins or alter ecosystems in a myriad of detrimental ways. Economic impacts of such events can also be large, including losses in commercial, recreational and subsistence fishing, drinking water contamination, and direct human contamination.

Our challenge is to not only understand the effects of each of these stressors on oceanic and freshwaters, but to project how ecosystems will change in the future. Current models based on individual factors are no longer sufficient. Yet, developing ecological models to understand multistressor effects is further challenged by the lack of sufficient data on the effects of interactive stressors across different trophic levels and the substantial variability in climate changes on regional scales. This talk will review the complexities of these multistressors and some approaches to understand and model their synergistic effects, and some scenarios of future changes.

## Biography

Dr. Patricia Glibert is a Professor at the University of Maryland Center for Environmental Science (UMCES), Horn Point Laboratory. Dr. Glibert is an oceanographer whose work has centered around questions related to nutrient dynamics and phytoplankton physiology and ecology. Her current work is focused on the linkages between nutrient over-enrichment and harmful algal blooms (HABs). She has studied algal blooms in many parts of the US, from Maryland to Florida, California to New York, and across the world, from Australia to the Baltic, from Brazil to China. She also taught marine ecology for several years in China.

She received her B.A. from Skidmore College, M.S. in Earth Sciences from the University of New Hampshire, and Ph.D. in Organismal and Evolutionary Biology from Harvard University. She was a

Postdoctoral Scholar and an Assistant Scientist at the Woods Hole Oceanographic Institution prior to moving to Maryland in 1986. Dr. Glibert received an honorary doctorate for her work on algae from Linnaeus University, Sweden, in 2011, and she was named one of the top 25 women professors in Maryland. She is an elected Fellow of the American Association for the Advancement of Science and a Sustaining Fellow of the Association for the Sciences of Limnology and Oceanography (ASLO). Dr. Glibert is also the incoming President of the Association for the Sciences of Limnology and Oceanography (ASLO).

Dr. Glibert has authored or co-authored over 200 publications, including articles written for children. She is currently completing a textbook on phytoplankton ecology which will go to press in early 2023. She is also active in several national and international efforts related to eutrophication and water quality. From 2006-2012 she co-chaired the U.S. National HAB committee. She also co-chaired an international working group on land-based nutrient pollution and HABs, and she chaired the core research program on eutrophication in the Global Ecology and Oceanography Harmful Algal Blooms Program.

# Keynote Forum
# Day-1

## John J. Sansalone

## Haochen Li [1], John J. Sansalone [2]

[1]Department of Civil and Environmental Engineering, University of Tennessee,   United States
[2]Engineering School of Sustainable Infrastructure and Environment, University of Florida, United States

# Water Treatment Clarification Implemented with a Next-Generation Coupled Computational Fluid Dynamics Machine Learning Model

## Abstract

Computational fluid dynamics (CFD) and machine learning (ML) are combined as a modeling platform (CFD- ML) developed from physical model data and CFD simulations over a wide range of urban drainage clarifier configurations, loadings, hydrodynamics and PM granulometry. The modeling tool is based on physical modeling and CFD databases. A novel augmentation of CFD with ML models is developed and trained to create surrogate clarification models. For a clarifier, modules in the CFD-ML platform facilitate (1) analysis,
(2) optimization, and (3) optimization with retrofits. Results with CFD-ML benchmarking indicate that: (a) historical models based on residence time (RT) are not accurate or generalizable for clarifier PM separation,
(b) RT models are agnostic to geometrics, hydrodynamics and PM granulometry and do not reproduce PM separation, (c) Trained ML models provide high predictive capability (± 15%) for PM separation. Dynamic similitude analysis indicates that clarification is primarily a function of the Hazen number and clarifier horizontal and vertical aspect ratios. With a common presumptive guidance of 80% for PM separation, a Pareto frontier analysis of the CFD-ML model generates significant economic benefit for clarifier planning/design/retrofits. CFD-ML demonstrate that enlarging clarifier dimensions (increasing RT) to address impaired behavior can result in exponential cost increases, irrespective of infrastructure adjacency conflicts.

1. Introduction

Urban drainage generated from storm events transports chemical, pathogens, particulate matter (PM) constituents to receiving waters, impacting aqueous chemistry acutely and chronically with consequences to public health. For a half-century, clarification systems, specifically urban drainage clarifiers have been a common unit operation (UO) with unit process (UP) functionality deployed in built environs for hydraulic/volumetric management and clarification. Urban drainage clarification basins in the United States (US), now exceeds 10 million. These basins intercept approximately 25% of the runoff in the USA with potential significant benefit to the urban water cycle and built environs. Despite basin ubiquity, fundamental PM and PM-associated chemical transport and fate processes are poorly understood. This knowledge gap is a result of the complexity of nonlinear interaction and multiphase coupling of turbulence, partitioning and heterodisperse PM. Currently, design and regulatory guidance of clarifiers employs presumptive criteria based on mean residence time (RT), driven by basin volume and mean flow metrics. Decades of such design and practices have led to an impairment designation for most clarification basins. More importantly, basins do not

meet intended functionality, with disposition of PM, chemicals and pathogens harmful to humans and the urban water cycle. In most cases, geometric expansion of basins, tanks or tunnels is not viable due to infrastructure constraints; an even greater constraint in the built environs of Europe. There is a critical need to supplant existing tools with higher-fidelity physics-based simulation tools to inform (1) design/regulatory guidance, (2) basin functionality and (3) intra-basin retrofits, such as with internal baffles to train clarifier hydrodynamics.

**2.** Methodology

Figure 1 summarizes the CFD-ML model methodology with the ML models illustrated (ANN: artificial neural network, RF: random forest, DT: decision tree and SR: symbolic regression). The databases are generated from CFD simulations (HiPerGator at University of Florida) for a 160,000 combinations of geometric configurations, PM granulometry, loading conditions and physical model data as shown in (a). Data structure layouts for the ML model development with dimensionless basin quantities are illustrated in (b) and the ML models illustrated in (c) through (e). The deployment of the ML surrogate model is illustrated in (f). Details of the CFD development and ML models are provided by Li and Sansalone 2022a, Li and Sansalone 2022b.
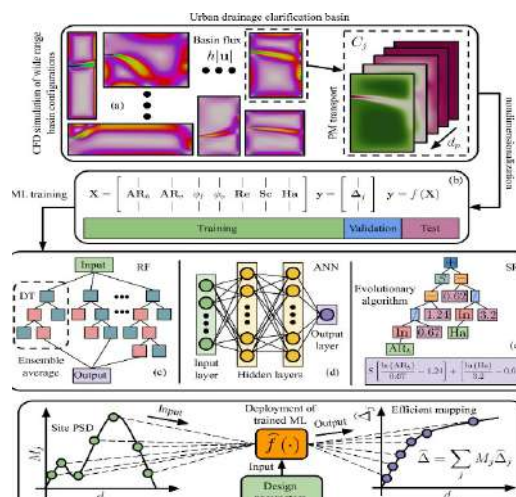


Figure 1. Illustration of the flowpath of the CFD-ML modeling methodology

**3.** Results

Figure 2 illustrates the results of the CFD-ML model, DeepXtorm for a rectangular basin (6:1 length to width) with a depth of 3 m and 1.4 hectares of surface area at normal pool elevation. The basin receives direct wet weather flows from a 50 hectare urban drainage area. Three results are illustrated in Figure 2. The Heinemarm (1981) result is an historical embodiment of PM clarification based on RT where Harper and Baker (2003) represents
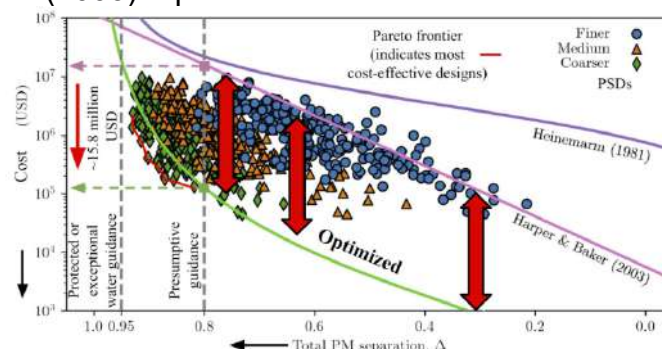
current presumptive guidance for PM and nutrient clarification. The Optimized result is based on CFD-ML and this result was benchmarked with monitoring data, clarifier retrofit and land costs (FDOT, 2016). At a presumptive guidance level of 80% for this clarifier there is a 15.8 million USD reduction in land and construction costs through CFD-ML optimization to retrofit the clarifier as compared to RT requirements.

Figure 2. CFD-ML optimized clarifier, Pareto frontier and conventional RT method cost curves

4.   Conclusions

DeepXtorm is a CFD-ML modeling platform for urban drainage clarifiers that facilitates (a) analysis of an existing system, (b) optimization of a proposed design, or (c) retrofit optimization of an impaired clarifier to upgrade performance. Model viability is based on 160,000 CFD simulations facilitated by high performance computing and then coupled in DeepXtorm with ML algorithms to optimize clarifier geometrics (or retrofits) to achieve a required level of performance, for example 80% PM or nutrient clarification. Results, benchmarked with monitoring and cost data for a full-scale operational clarifier, demonstrate that optimization provides cost reduction of at least 10X compared to presumptive guidance regulations based on residence time.

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## Biography
John Sansalone, PhD, PE is a Full Professor of Engineering at the University of Florida, USA. Research and teaching areas of interest include physical and computational modeling methods for unit operations and processes focused on urban water treatment and management, green infrastructure for the urban hydrologic and heat cycle, urban water infrastructure design, combined sewer and wastewater treatment, water and soil chemistry analysis and monitoring. He is a member of the PhD faculty at Bari Politechnical University and has been a visiting Professor at Milano Politechnical University, University of Genoa, University of Bologna, University of Parma, and University of Calabria. He is an Associate Editor at Water Research. He has over 200 research publications and over 200 presentations worldwide. Beyond his academic career, he is an active triathlete and marathoner.

## B. Cyffka
Catholic University of Eichstaett-Ingolstadt, Floodplain Institute Neuburg/Danube, Germany

# Ecosystem Services and Restoration Opportunities for a Sustainable Environmental Development along the Danube River

## Abstract
Floodplains are one of the most vulnerable ecosystems in the world and under constant pressure. Many floodplains are meanwhile destroyed or at least heavily modified, for example, the proportion of near-natural floodplain areas in Germany is around 5% of the original area. This is a very critical share because floodplains are everywhere hotspots of biodiversity.

This crucial development started in the middle of the 19th century, many changes were made regarding the courses of major Europe rivers and the land use of the adjacent floodplain areas. This lead partly to a total change of ecosystem functions—wetlands and other water dependent ecosystems were change to agricultural land and/or terrestrial forests. This situation was boosted by better technology in hydraulic engineering for river embankments, the increasing construction of hydropower dams as well as a furthermore demand for reliable agricultural and space for settlements. The former land use changes in floodplain areas have often the reason of land reclamation without observing ecological issues and/or ecosystem services coming from these regions. Drawing the conclusion, it is obvious that it is necessary to remediate or even restore the formerly conditions. The problem is that this is not possible in case of settlements involved in the respective areas. New future planning and restoration measures are necessary.

These planning should have as final goal the sustainable environmental development of the respective floodplain areas. To achieve this goal the concept of ecosystem service is a useful tool that can help to assess unbiased.

The presentation will show examples along the most international river of Europe, the Danube.

## Keywords
Danube, Floodplains, Ecosystem Services, Sustainable Development, Restoration

## Biography
Dr. Bernd Cyffka is full professor at CU Eichstaett-Ingolstadt since 2005 and is heading the Floodplain Institute since 2006. He is president of IAD (International Association for Danube Research; since 01.01.2022). He is a member of several national and international organizations and networks in the area of hydrology and river/floodplain ecology. His research interests are in the fields of floodplain ecology, restoration, ecosystem services, hydromorphology and ecohydrology. He (co-)authored more than 60 publications in SCI journals and many conference proceedings, book chapters and other scientific articles as wells as four books. Furthermore, he (co-)edited ten books. He is co-editor of the journal, and associated editor of the journal 'Regional Sustainability', and member of the editorial board of the 'Journal of Arid Land'. He was and is involved in several national and

international projects, especially EU projects, partly in leading position, and mainly in the Danube Catchment and Central Asia.

## Rony Wallach

The R.H. Smith Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem, Israel

## The Effect of Using Treated Wastewater for Irrigation on Soil Wettability, Water Flow, and Chemical Transport in the Root Zone

### Abstract

Treated wastewater (TWW) has gained recognition as an alternative source for freshwater irrigation and is steadily expanding worldwide, particularly under the current climate change. Beyond its many advantages, it has been found that prolonged use of TWW renders the soil water-repellent to certain degrees. The flow in these soils has been known to take place in preferential flow pathways (unstable flow). This lecture presents the results of a study performed in a commercial citrus orchard grown on sandy-loam soil in central Israel that has been irrigated with TWW. Electrical resistivity tomography (ERT) surveys revealed that water flow in the soil profile is occurring along preferential flow paths, leaving behind a considerably non uniform water-content distribution. The preferential flow in the soil profile led to uneven distribution of salts and nutrients, with substantially high concentrations in the drier spots and lower concentrations in the wetter spots along the preferential flow paths. The chemical's pore concentration, which depends on the local soil water content, is higher than paste-measured concentrations and may even reach toxic values. This could partially explain the negative effect that prolonged TWW irrigation has on soil and trees. The relationship between water-repellent soils and the spatially non uniform distribution of nutrients and salts in the root zone was verified in a consecutive in-situ study where soil water repellency was eliminated by surfactant application to the soil. Repeated ERT surveys and chemical concentration measurements in disturbed soil samples along transect revealed that the surfactant application diminished the preferential flow pathways and rendered the soil water and dissolved chemicals uniformly distributed. The preferential flow elimination and increased chemical distribution uniformity increase yield compared to the surfactant-untreated soil. The different aspects of the results will be further presented and discussed.

## A. Leka

## A. Leka*, A.Kakotariti[2], and M.Papadopoulou[3]

[1,2,3]Dept. of Geography and Regional Planning, School of Rural, Surveying and Geoinformatics Engineering, National Technical University of Athens (NTUA), Athens, Greece

## Assessing Urban Environmental Sustainability The Case of Three Municipalities in the Northern Part of Athens-Attiki

### Abstract

The rapid growth of the world's population and the urbanization trend over the last three decades, has led to mismanagement and operational problems of the resources of the natural and the manmade environment of the cities. This gradually led, to the degradation of most citizen's quality of life.

The rapidly escalating share of the world's urban population (54,5 per cent in 2016) is a distinguished feature of this highly transformative trend, while its ominous future projections (60 per cent by 2030) (UN, 2016) present overwhelming challenges to city governments (Harrison & Donnelly, 2011) in attaining 2030 UN Agenda Sustainable Development Goal (SDG) 11 towards inclusive, safe, resilient and sustainable cities and human settlements. Moreover, overcrowded urban areas, as places of excessive use of resources (e.g. energy, water and land), informal development, pollution, congestion, overproduction of waste, unemployment, migration, segregation and poverty, etc. are considered the main source of contemporary global challenges and risks (Stratigea et al., 2017).

The efforts of developing sets of indicators for assessing sustainable cities' performance has globally rapidly grown in alignment with cities' efforts to smarten up. Each different set appearing in the literature so far reflects, in one way or another, the specific needs for which it has been developed, each time enriched with urban indicators that reflect current conceptualization of development, well-being, and prosperity (Gómez-Álvarez et al., 2018).

This paper's work follows an indicator-based stream (Figure 1) built upon a top-down approach for guiding the selection of city environmental sustainability indicators. This approach brings on board existing knowledge on relevant, well-established European/National indicator systems (such as the set of indicators proposed by the United Nations 2030 Agenda, the International Organization for Standardization's ISO 37120 standard: 2018 and the objectives of the Hellenic Standardization Organization HSO 1457. Relevant information and data mentioned in the Strategic Business Plan Plans of each municipality under study were taken into consideration also.
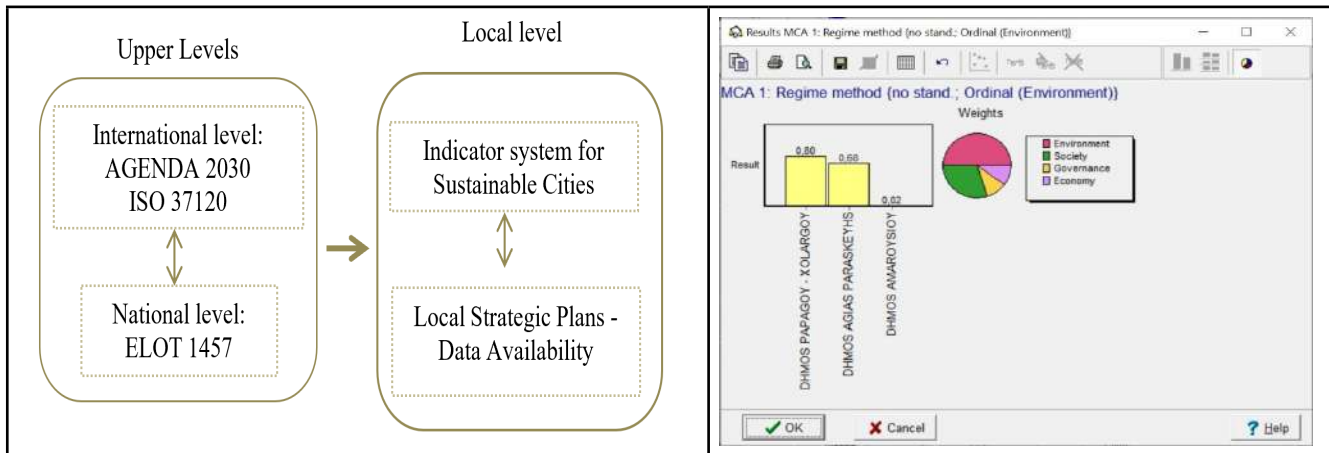
**Figure 1**. Methodological framework, Figure 2. Ranking of the results

Subsequently, an evaluation process was adopted so that the three under study areas (municipalities of the Regional Unit of the Northern Sector of Athens) to be classified according to their progress towards environmental sustainability. The three case studies were chosen due to their similarity in natural and socioeconomic peculiarities, such as geomorphology, land uses, their building density, the employment sectors of the citizens etc.

The free software of DEFINITE which uses the multi-criteria analysis method REGIME was chosen for the evaluation process. The results are shown in Figure 2.

The proposed model aims at providing assistance to urban planners and policy makers in assessing, monitoring, managing cities and making more informed decisions for serving sustainability in diverse urban contexts with a focus on the environmental one.

## Keywords
Urban Sustainability, Environmental Indicators, City Environmental Performance

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## Biography

Akrivi Leka holds a Diploma in Rural and Surveying Engineering from NTUA, 1998. She also holds a Master Degree in 'Environment and Development' (NTUA, 2000), a Master Degree in 'Environmental Resource Management' (Brandenburg Technical University, Germany, 2004) and a PhD from NTUA (2012) in Urban Sustainability ('Environmental Sustainability in Urban Small and Medium-sized Coastal Cities - Approach to Environmental Indicators'). Since September 2007, she is lecturing at the Dept. of Geography and Regional Planning, School of Rural and Surveying Engineering, NTUA in undergraduate and graduate level. Presently, she is a senior researcher at NTUA, while she also works as a freelancer in Surveying and Environmental Management Projects.

She owns a specific license for conducting Environmental Impact Assessment Projects (EIAP) in private and public sector (2003) and she is the author of a number of EIAPs'. She has participated in a number of national and international conferences, while also published her work in scientific national and international journals and conferences. Research interests: Environmental Planning in Urban and Sub-urban level, Sustainable Urban and Regional Development and Policy, Environmental Policy, Development of Environmental Indicator Systems for monitoring and managing the quality of Urban and Sub-urban Environment, Resiniency in Urban and Sub Urban level, Climate Change Adaptation Planning.

# Invited Forum
## Day-1

## E. J. Cha

E.J.Cha[1,*],H.S. Do[1].J.W.Kim[2], E.C. Chang[2].S.W. Son[2], and G.W.Lee[2]

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[2]Special Center for Changma Research,Gongju, Republic of Korea.

# Climate Change and Long-Term Change of Extreme Precipitation over the East Asia

## Abstract

The change of the precipitation characteristics over the Republic of Korea and East Asia is investigated using long-term (60 years) hourly precipitation records from surface station focusing on summer monsoon season (June to September). The precipitation characteristics including extreme events (>30mm/h or >100mm/day) are especially compared for the past (1961-1990) and recent (1991-2020) climatology. The summer precipitation shows a notable increase over South Korea (2.6mm/day, century) although smaller than the North Korean precipitation trend (9.7 mm/day, century). Both precipitation intensity and amount are significantly increased particularly in 70-100 and 200 mm/day intensity range.

The frequency of extreme precipitation also exhibits an increasing trend during the last 60 years over the Republic of Korea. Further investigation using gridded precipitation reveals that this the similar mean and extreme precipitation increases are observed over the wider regions in East Asia, including central China and southeastern Japan. This result indicates that the long-term precipitation change over the Republic of Korea was likely driven by a large-scale monsoon circulation change.

## Keywords

Summer precipitation, Changma (stationary rainy front), long-term trend, extreme events

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## L. Chen

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# Optimization and Modeling of Microwave Irradiated Ammonia Nitrogen Removal from Anaerobically Digested Liquid Dairy Manure

## Abstract

Removal and recovery of ammonia nitrogen ($NH_3$-N) from dairy manure has gained increased attention among researchers to make better uses of manure N fertilizer values. In this study, microwave (MW) irradiated $NH_3$-N removal from anaerobically digested liquid dairy manure was performed and key operational parameters viz. pH, treatment time (min), and power (W) were optimized and modeled via response surface methodology (RSM) and RSM-artificial neural network (ANN). The role of operational parameters on the performance of the treatment process was first evaluated using RSM. Afterward, RSM was combined with ANN to predict the $NH_3$-N removal. Although all the operational parameters at a linear level along with the interactive effect of treatment time, power, and pH at a quadratic level significantly influenced $NH_3$-N removal from the waste stream ($p < 0.001$), pH acted as the primary factor affecting $NH_3$-N removal during the MW irradiated treatment process. Under the optimal conditions (pH: 10.1, treatment time: 4.1 min, and power: 675 W), the $NH_3$-N removal efficiency of $86.7 \pm 1.85\%$ was observed and found to be in line with the computational values from both the RSM and RSM-ANN models. Furthermore, a statistical comparison between the models demonstrated the RSM-ANN model has greater prediction potential than the RSM model. The high $NH_3$-N removal efficiency obtained under the optimal conditions indicates the effectiveness of the process and will further encourage the application of MW irradiation to treat anaerobically digested liquid dairy manure in pilot and full-scale processes.

## Keywords

Ammonia Nitrogen Removal; Response Surface Methodology; Artificial Neural Network; Optimization; Anaerobic Digestion; Dairy Manure

## Biography

Dr. Lide Chen's research focuses on value-added products from Ag bioproducts and mitigation of environmental impacts caused by Ag bioproducts.

## Taghreed Alsufyani

Department of Chemistry, College of Science, Taif University, P.O. Box 11099, Taif 21944, Saudi Arabia

# Date Palm-Red Palm Weevil-Natural Enemy Interactions: Chemical Detection of Infestation within 24-Hours

## Abstract

Among the different threats to the growth and production of palm trees, the red palm weevil (RPW) remains one of the most extreme plagues that infect, threaten and eliminate the palms. However, Metarhizium anisopliae is a vital natural enemy of PWR and contributes to its eradication. To understand the ecology of this relation, we explored changes in date palm's chemosphere, where airborne metabolites mediate the beneficial and detrimental interaction. Thereby, date palm artificially infested by RPW and then treated with M. anisopliae, forming a tritrophic community. For more understanding, date palm inoculated with M. anisopliae before infestation. Under these precise conditions, bioactive and environmentally appropriate airborne natural products can be explored. After 24 hours, Closed-loop stripping (CLS) and open-loop stripping (OLS)-extracted metabolites were analyzed using gas chromatography-mass spectrometry (GC-MS) combined with necessary ecological statistical tool and multivariate analyses. It was demonstrated that different beneficial and detrimental relationships between organisms in the tritrophic community contributed to the excretion of certain airborne metabolites within the chromosphere. Canonical component analysis of principles coordinates of GC-MS data revealed robust distinctions between date palm's chemosphere of noninfested palm, noninfested palm with M. anisopliae, RPW-infested palm, RPW-infested palm with M. anisopliae. Furthermore, airborne biomarkers, including phenols and esters, were identified as potential indicators for date palm infestation by RPW within 24 hours.
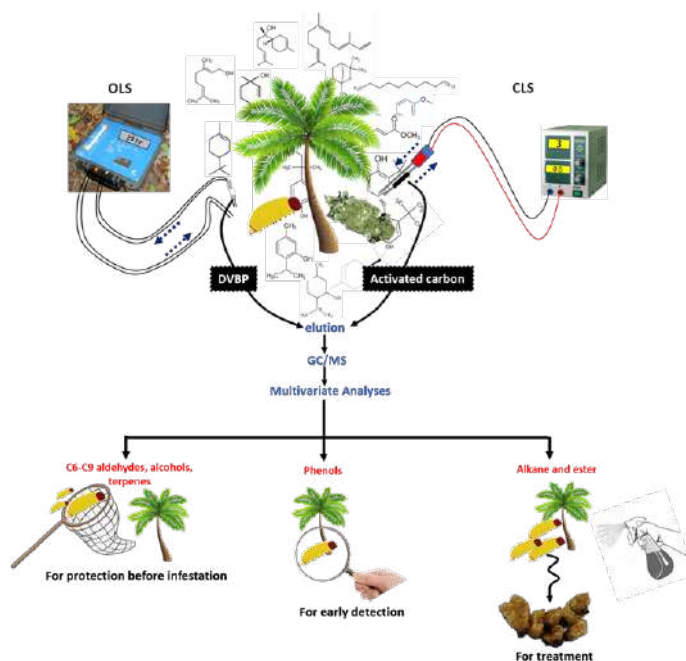
## Castine Bernardy

Castine Bernardy, Dr. Jim Malley

Department of Civil and Environmental Engineering, University of New Hampshire, USA

# Efficacy of UV$_{254}$ and BL$_{405}$ as Disinfection Technologies for Surface Disinfection

## Abstract

This presentation will address a research project that began at the height of the COVID -19 pandemic when filtering facepiece respirators (FFRs) were in limited supply. First responders around the nation were seeking methods to disinfect their FFRs for reuse. These inquiries sparked a research project using UV to disinfect four models of FFRs using UV doses up to 3000 mJ/cm$^2$. The surrogates used for these experiments were E. coli and MS-2 Bacteriophage. The results of these experiments revealed valuable information that must be considered in surface disinfection applications. The presentation will discuss factors found to be important for surface disinfection applications, such as material type, surface interactions (potential material degradation), material porosity (including the effect of shadowing), and the hydrophilic/hydrophobic nature of the material.

The presentation will cover our further exploration intothe importance of material type, surface charge, porosity of the material of interest, and optical design of the UV device. The surfaces experimented on included aluminum, ceramic, Formica Laminate, PTFE (Teflon), and stainless steel. Formica Laminate and stainless steel were selected as they are common surface materials in healthcare settings. The results for the aluminum surfaces were surprising in that they suggest that the germicidal nature of aluminum is more significant than the effect of UV for this surface. The characteristics that proved to have the largest effect on UV efficacy will be discussed in detail and include pore size distribution, contact angle, and reflectivity.

In addition, the presentation will include data from experiments utilizing blue light (405nm). The most current literature states that blue light has germicidal effects yet does not cause the adverse health effects seen with UV-C, therefore, it is thought that it can be run continuously. Applications of blue light technology could be utilized in hospital rooms and surgical suites, providing a continual barrier against pathogens and HAIs for patients and hospital staff. Thepresentation will reveal findings regarding the effects of viral desiccation and ambient dew point that must be considered before full-scale application of blue light technologies.

## Biography

Castine Bernardy is a Ph.D. candidate at the University of New Hampshire in the civil and environmental engineering department. She received her Bachelor's and Master's of Engineering in environmental engineering from the University of New Hampshire in 2019 and 2021, respectively. In addition, she received her EIT (Engineer in Training) certificate in 2019.Her doctoral research started at the beginning of the COVID-19 pandemic, studying the effects of UV$_{254}$ as a disinfection technique for FFRs. Her research then expanded into exploring the effects of surface characteristics and causal interactions of UV$_{254}$ and BL$_{405}$ (blue light) She specifically studies materials commonly

used in healthcare settings and others with varying porosity, contact angles, and surface charges. Bernardy is working on several publications about her findings and has authored Effects of UV-C Disinfection on N95 and KN95 Filtering Facepiece Respirator Reuse.

# EnScience2023

**2nd Global Summit on Environmental Science and Applications**
**May 25-26, 2023 | Brussels, Belgium**

## L.Ighil Ameur
[1]Cerema, Institut Carnot Clim'adapt, Blois, France.

## Impacts of Severe Droughts on Infrastructures Built on Clay Soils Under Climate Change Effects

### Abstract

The well-known shrinkage-swelling phenomenon of clayey soils intensifies durably under climate change effects after the severe droughts happened since 2015. This has an important impact on the hydromechanical properties of unsaturated soils, especially during desiccation cracking that induces more damages on the slight infrastructures such us: houses and roads.

The annual estimated cost by insurance of houses damage due to the shrinkage-swelling phenomenon exceeds £400 million in UK (Driscoll & Crilly, 2000) and $15 billion in US (Jones & Jefferson, 2012). In France, more than 10.4 million houses are highly exposed to the shrinkage-swelling phenomenon of clayey soils and the new national zoning shows that high or medium exposure now concerns 48% of the metropolitan soils. The cost of drought damage compensated by insurers is estimated to €2.9 billion for the 2022 severe drought (France Assureurs, 2022).Roads are also severely impacted by the shrinkage-swelling phenomenon through damage characterized most often by longitudinal cracks close to the edges and very significant deformations that can be a danger for the safety of users.

In France, Cerema is working with the economic actors to develop new solutions in order to adapt infrastructures built on clayey soils and subjected to the shrinkage-swelling phenomenon. The first approach is experimental at the laboratory scale in order to understand how the natural unsaturated clay soils shrink and swell under numerous drying-wetting cycles. The second approach consist of several in situ experimentations of different techniques to reduce the shrinkage-swelling impact on unsaturated clay soils. Such us: reducing the evaporation in the layers close to the atmosphere, rewetting the clay soil with stored rainwater during drought and chemical stabilization of soil by injecting potassium solution. Each test was continuously monitored using suction and cracking sensors.

The first results show that at the laboratory scale, the unsaturated clay soils can be significantly affected after some drying-wetting cycles. This can help us to understand how the climate change conditions can further deteriorate the properties of these soils and induce structural damages. In situ monitoring results show that some techniques allow clay soils to save their hydromechanical properties at a hydric equilibrium state which can reduce settlement deformations.

### Keywords
climate change, drought, clay soils, shrinkage-swelling, hydromechanical properties, adaptation

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# David Lea
University of Papua New Guinea, Papua New Guinea

## Associated Ethical Issues for REDD Based Emissions Trading Schemes in Melanesia

This paper recounts the genesis of REDD (Reducing Emissions from Deforestation and Degradation) and the early history under the stewardship of Kevin Conrad.  The text describes the efforts to apply REDD in Papua New Guinea, conceptual difficulties and more recent efforts to make the program work. One begins with the premature trading of REDD credits in 2008/2009 and associated REDD scandals in Papua New Guinea. This is followed by a discussion of the speculative nature of the carbon credit market and the dangers it poses for Papua New Guinea.  The paper also discusses the April Salumei project that was the only survivor of the many REDD plus pilot projects that were promoted in 2008, and the only one that seemed to have any prospect of producing marketable carbon credits, instead of receiving funds from the national budget or foreign aid. But land owner disputes have resulted in thesuspension of the carbon trading project in April Samulei. At this point, this project may have been rescued in August 2019 when the Ministry of Conservation Environment and Climate Change signed agreements with the landowners' representatives from the April Salumei area to allow the resumption of the carbon trading project.  Ultimately REDD once offered the promise that PNG could still receive benefits from their valuable forest resources and do so without harvesting the timber, while satisfying the environmentalists demanding the forests remain an unspoiled repository of sequestered carbon. Unfortunately at this stage the belief in REDD and REDD+ as a sufficient income generating substitute for timber harvesting, remains unfulfilled.

Shuangshuang Zhao,
Shuangshuang Zhao[1,2,3], Xu Yang[2,3], Hang Li[1], Rong Shen[1,*], Yankai Xia [2,3,*]

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# Serum Concentrations of Neonicotinoids in Pregnant Women: Association with Early Spontaneous Abortion

## Abstract

Objectives: As one class of the most widely used pesticides, neonicotinoids are highly detected in the population. However, few studies are focused on the neonicotinoids exposure in pregnant women, and the evidence of the association between neonicotinoids exposure and early spontaneous abortion remains inadequate. Our study aimed to investigating the neonicotinoids exposure in pregnant women and exploring the correlations between early spontaneous abortion and exposure to neonicotinoids during pregnancy.

Methods: In the study, a case-control study was designed to explore the association between neonicotinoids exposure and early spontaneous abortion. 50 miscarriage cases and 50 control ones before 12 gestational weeks were included. The ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS) was used to investigate the concentrations of 11 neonicotinoids in serum of the participants. Then, the association between exposure to neonicotinoids and early spontaneous abortion were analyzed by using logistic regression model and multi-exposure models including weighted quantile sum (WQS) regression, Bayesian kernel machine regression (BKMR) and principal component analysis (PCA).

Results: Half of the 11 neonicotinoids were found to have extensive exposure in pregnant women, imidacloprid and clothianidin were detected in most participants with the detection rate more than 70%. Moreover, the results of exposure–outcome associations showed that imidacloprid was positively associated with early spontaneous abortion, which suggested that exposure to imidacloprid during pregnancy could increase the risk of early spontaneous abortion.

Conclusions: Our findings highlight the potential risk of exposure to neonicotinoids during pregnancy, and more epidemiological evidence were given for the effects of neonicotinoids exposure on maternal health.

## Keywords

Neonicotinoid pesticides; Imidacloprid; Early spontaneous abortion; Multi-exposure models

## Biography

In 2014, graduated from Jilin Agricultural University majoring in Applied Chemistry. In 2019, she began her doctoral joint training in University of Hawaii at Manoa, USA. In 2021, she received

her doctorate degree in pesticide science from Nanjing Agricultural University, Nanjing, China. In the same year after graduation, she performed postdoctoral research at the Women's Hospital of Nanjing Medical University, Nanjing, China. She has contributed to 19 peer-reviewed publications, including 7 papers as the first/co-first author published in top journals with 300 citations.

## Beibei Gao

Beibei Gao [1], Yuepei Zhang[1], Zhaofeng Liu[1], Chao Dong[1], Yankai Xia[1*]

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# Stereoselectivity of Progeny Neurodevelopmental Abnormalities Caused by Exposure to Fipronil during Pregnancy Mediated by GABAAR

## Abstract

Objectives: To identify the high risk enantiomer of neurodevelopmental abnormalities in offspring due to exposure to fipronil enantiomers during pregnancy. To illuminate the mechanism of stereo selective difference in the effects of fipronil enantiomers on neural development in children

Methods: 1. To exploring the relationship between fipronil enantiomers exposure during pregnancy and neurodevelopmental abnormalities in offspring by a large prospective birth cohort; 2. Based on the actual exposure levels obtained from the population study, the mice model of poisoning was constructed to verify the results of the population study; 3. The differential target subunits and active sites of the fipronil enantiomer on γ-aminobutyrate receptor (GABAAR) were further located by combining the hippocampal neural stem cells of offspring mice with Stable Isotope Labeling by Amino acids in Cell culture combing with Activity-based Protein Profilings (SILAC-ABPPs).

Results: R-fipronil exposure during pregnancy was positively correlated with neurodevelopmental abnormalities, but S-fipronil does not have the same effect. Further animal experimental and SILAC-ABPPs results suggest that exposure to fipronil enantiomers during pregnancy can lead to stereo selective neurodevelopmental abnormalities in progeny by influence of GABAAR subunits.

Conclusions: The differential target subunits and active sites of the fipronil enantiomer on GABAAR caused stereoselective neurodevelopmental abnormalities. This study will provide a direct basis for the formulation of early, precise prevention and intervention of fipronil enantiomers, as well as providing a reference for the management policy of chiral pesticides.

## Biography:

In 2014, graduated from Jilin Agricultural University majoring in Applied Chemistry. In 2019, he began his doctoral joint training in Toxicology Center of University of Antwerp, Belgium. In 2021, he received his doctorate degree in pesticide science from Nanjing Agricultural University. In the same year after graduation, he performed postdoctoral research in the School of Public Health, Nanjing Medical University, China. He has contributed to 35 peer-reviewed publications, including 5 papers as the first author published in top journals with over 700 citations. He has attracted >600k RMB research funding in last year.

Research interests: Environmental safety and human health, Chirality of pesticides, Trace analysis of pesticide exposure

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## Yun Fan

Yun Fan[1], Yufeng Qin[2], Minjian Chen[1], Xiuzhu Li[1], Ruohan Wang[3], Zhenyao Huang[1], Qiaoqiao Xu[1], Mingming Yu[1], Yan Zhang[4], Xiumei Han[1], Guizhen Du[1], Yankai Xia[1], Xinru Wang[1, *], Chuncheng Lu[1, *]

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## Prenatal low-dose DEHP exposure induces metabolic adaptation and obesity: Role of hepatic thiamine metabolism

### Abstract

Di-(2-ethylhexyl)-phthalate (DEHP) is a ubiquitous environmental pollutant and is widely used in industrial plastics. However, the long-term health implications of prenatal exposure to DEHP remains unclear. We set out to determine whether prenatal DEHP exposure can induce metabolic syndrome in offspring and investigate the underlying mechanisms. A mouse model of prenatal DEHP exposure (0.2, 2, and 20 mg/kg/day) was established to evaluate the long-term metabolic disturbance in offspring. The mice were profiled for the hepatic metabolome, transcriptome and gut microbiota to determine the underlying mechanisms. Thiamine supplementation (50 mg/kg/day) was administered to offspring to investigate the role of thiamine in ameliorating metabolic syndrome. Prenatal exposure to low-dose DEHP (0.2 mg/kg/day) resulted in metabolic syndrome, including abnormal adipogenesis, energy expenditure and glucose metabolism, along with dysbiosis of the gut microbiome, in male offspring. Notably, hepatic thiamine metabolism was disrupted in these offspring due to the dysregulation of thiamine transport enzymes, which caused abnormal glucose metabolism. Prenatal low-dose DEHP exposure caused life-long metabolic consequences in a sex-dependent manner, and these consequences were be attenuated by thiamine supplementation in offspring. Our findings suggest low-dose DEHP exposure during early life stages is a potential risk factor for later obesity and metabolic syndrome.
Keywords

DEHP; Gut microbiota; Obesity; Prenatal exposure; Thiamine.

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## Biography

Yun Fan, Ph.D., Postdoctoral Fellow, Department of Microbiology and Infection, Nanjing Medical University. He obtained Ph.D from Nanjing Medical University majoring in Toxicology in 2021. He is mainly engaged in research on gut microbes and epigenome, focusing on the mechanism of interaction between gut microbes, metabolites and host chromatin modifications in metabolic diseases.

Research interest: Gut microbes and epigenome; Environmental exposure and health

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## Jiawei Duan

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[3]Epidemiology Branch, National Institute of Environmental Health Sciences, National Institutes of Health, Department of  Health and Human Services, Durham North Carolina, USA.

# Metabolome Signatures of the Maternal Exposome during Pregnancy

## Abstract

Pregnancy is a critical period for maternal and offspring health. Exposures during pregnancy may lead to adverse outcomes in both mother and fetus that manifest both early and much later in life. Application of the exposome concept to pregnancy would enable the assessment of the burden of exposure to a larger range of chemicals. However, there is limited evidence regarding exposure to a wide array of chemicals and the metabolome during pregnancy.

Here, we studied the relationship between the urinary exposome and metabolome during pregnancy. Urine samples were collected in the first and third trimesters from 1,024 pregnant women recruited in prenatal clinics in Jiangsu Province, China. The exposome was analyzed using the first trimester sample with ultra-high performance liquid chromatography–high resolution accurate mass spectrometry (UHPLC-HRMS) and inductively coupled plasma mass spectrometry. The metabolome was analyzed using the third trimester sample with UHPLC-HRMS. We evaluated associations between each of 106 exposures in the first trimester with 139 metabolites in the third trimester.

We identified 1,245 significant associations ($p < 3.39 \times 10^{-6}$, Bonferroni correction) between chemical exposures and maternal metabolism during pregnancy. Among elements, the largest numbers of the significant metabolic associations were observed for magnesium, and among organic compounds, for 4-tert-octylphenol. Weinte gratedt he metabolic associations with exposures identified in our data with published reports of associations of exposures and health outcomes in pregnancy to explore mechanisms, generating a large volume of information on possible mechanisms underlying the relationships between chemicals and various outcomes, such as birth weight.

In conclusion, by conducting an exposome and metabolome wide association study during pregnancy, we provide a comprehensive assessment of exposure to elements and organic chemicals exposure in a large sample of pregnant women. This study identified many associations between chemical exposures and maternal metabolism during pregnancy from anomics-wide perspective with large sample size and interpreted potential health implications of identified associations. This integration advances our knowledge of the environmental basis of metabolic variation in pregnant women.

## Keywords
Exposome, Metabolome, Pregnancy

## Biography

Jiawei Duan is a graduate student at Nanjing Medical University whose main research interests include environmental chemical pollution and its relationship with human endogenous metabolism and reproductive health. His team mainly uses ultra-high performance liquid chromatography–high resolution accurate mass spectrometry (UHPLC-HRMS) and inductively coupled plasma mass spectrometry (ICP-MS) to evaluate the reproductive toxicity of a large number of exogenous chemicals, and identify risk factors and molecular markers affecting reproductive development. During postgraduate study (from 2020), he participated in many studies on the association between exposome and metabolome, some of which were published in Environ Health Perspect, Environ Int and Ecotoxicol Environ Saf.

# Poster Presentation Day-1

# Noura Alotaibi

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# Simplifying the Complex Relationship between Vitis vinifera, Aphis Illinoisensis, Coccinellaundecimpunctata, and Tapinoma Magnum

## Abstract

In order to protect Taif grape (Vitis vinifera) from the infestation by Aphis illinoisensis, it is obligated to understand the complex chemical language mediates the interaction between hostplant (V. vinifera), pest (A. illinoisensis), pest protector (Tapinoma magnum), and pest bio-enemy (Coccinellaundecimpunctata).The current study aims to simplify the complex chemical language spoken in tetrapartite community consists of V. vinifera, A. illinoisensis, T. magnum and C.undecimpunctata. For that, several systems of crushed organisms under liquid-nitrogen (mechanical stress) and two systems of dipartite community (T. magnum with C.undecimpunctata and V. vinifera with T. magnum) were performed to compare the air borne metabolites with those secreted in the chemosphere of tetrapartite community. Airborne metabolites were extracted by closed loop stripping and analyzed by gas chromatography coupled with mass spectrometry (GC/MS). The data was subjected to canonical analysis of principles coordinates (CAP). According to the analyses, there were differences in airborne metabolites between two systems of tetrapartite community. The system in which C.undecimpunctata was added first was distinguished by caryophyllene, citral, hexyl isovalerate, and decanal which was confirmed to be released also in dipartite community of T. magnum and C.undecimpunctata due to the detrimental interaction between them, while the system in which T. magnum was added first was characterized by esters i.e.,cis-3-hexenyl-alpha-methyl butyrate, (z)-2-hexenyl butyrate, 4,8-dimethylnona-1,3,7-triene.The similarity or difference of volatile compounds between the system exposed to natural stress or mechanical stress was also highlighted, e.g., 2-methyl-4-heptanone was shared between crushed T. magnum and tetrapartite community in which C.undecimpunctata was added first indicating that the source of this biomarker in tetrapartite community was the stressed ant due to the presence of C.undecimpunctata. However, we noticed that organisms when exposed to mechanical stress differ from the volatile compounds secreted from them when exposed to natural stress, where A. illinoisensis secreted the alarm pheromone beta farnesene when exposed to mechanical stress and did not secrete it when being with its bio-enemy C.undecimpunctata. Crushed V. vinifera stem system was distinguished by nonanal and D-limonene and crushed V. vinifera leaves system was distinguished by a biomarker 4-oxo-hex-2-enal.While the system of crushed T. magnum characterized by sesquiterpenes, long chain alkanes, and benzenoid derivatives, system of crushed C.undecimpunctata was distinguished by several biomarkers, the most prominent of which was undecane. Thus, the mechanical stressed systems as well as the dipartite community systems participated in detecting the source of two biomarkers found in tetrapartite community.

# Virtual Presentations

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## 2nd Global Summit on Environmental Science and Applications
### May 25-26, 2023 | Brussels, Belgium

# Xiaoguang Ouyang

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# Fate, Effects and Characteristics of Marine Debris in Coastal Oceans

## Abstract

Marine debris can be trapped in coastal oceans (including coastal wetlands, beaches and coastal seawaters) from terrestrial and oceanic sources. Plastics are the major components of marine debris. However, the stocks of plastics and their impacts on coastal wetlands are poorly known[1]. It remains unknown about the distribution of marine debris in the ocean [2] and the relationships between marine debris in the coastal zone and coastal seawaters. This talk presents (1) the stocks, fate and effects of plastics in coastal wetlands with plastic abundance from 112 studies, and (2) the characteristics of debris distribution and the relationships among the abundance and density of marine debris in the beach-sea continuum based on China's time series data (2012-2021). The representative abundance of plastics that occurs in coastal wetland sediments and is ingested by marine animals reaches 156.7 and 98.3 items $kg^{-1}$ , respectively, 200 times higher than that (0.43 items $kg^{-1}$) in the water column. Plastics are more abundant in mangrove forests and tidal marshes than in tidal flats and seagrass meadows. The variation in plastic abundance is related to climatic and geographic zones, seasons, and population density or plastic waste management. The abundance of plastics ingested by pelagic and demersal fish increases with fish length and dry weight. The dominant characteristics of plastics ingested by marine animals are correlated with those found in coastal wetland sediments. Microplastics exert negative effects on biota abundance and mangrove survival but positive effects on sediment nutrients, leaf drop, and carbon emission. There are significant differences in the abundance of plastics in the beach-sea continuum, as are the proportion of plastics in marine debris and the density of marine debris. There are significant relationships between the abundance of debris on seafloors and that on beaches, the abundance/density of debris on seafloors/sea surfaces and that on sea surfaces, as well as the proportion of plastics in marine debris on sea surfaces and that on beaches. It is highlighted that plastic pollution is widespread in coastal wetlands and actions are urged to include microplastics in ecosystem health and degradation assessment. The transportation of marine debris from beaches to seawaters can be estimated based on the relationships among the abundance and density of marine debris in the beach-sea continuum.

## Keywords
Marine debris; Plastics; Coastal oceans; Coastal wetlands; Beaches; Seawater

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## Biography

Xiaoguang Ouyang is a Professor at Southern Marine Science and Engineering Guangdong Laboratory (Guangzhou). He obtained his PhD in the area of marine ecology from Griffith University, Australia. He was a visiting scientist during June 2016-March 2018 at Wasser Cluster Lunz–Inter-university Centre for Aquatic Ecosystem Research, Austria. He worked as a postdoctoral researcher at The Chinese University of Hong Kong during March 2018-March 2022. Xiaoguang's research focuses on ecosystem services of marine ecosystems. He has published 36 papers, including 22 papers in top-tier journals (e.g. Nature Communications, Earth-science Reviews and Environmental Science & Technology) with 15 papers as the first-author. He has edited a book and a book chapter. He is an editor of Frontiers in Marine Science, a guest editor of Sustainability, and the co-chairs of ECSA57and ECSA58 – EMECS 13 conference sessions. He has served as reviewers for reputable journals, e.g. Nature Sustainability, Nature Communications and Water research.

## Cyril A. Cabello

Cyril A. Cabello[1], Nelfa D. Canini[2], Barbara C. Lluisma, Ed. D., LLB[3]

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## Water Quality Assessment of Dodiongan Falls in Bonbonon, Iligan City, Philippines

### Abstract
Water is an essential element that sustains life on this planet, yet it is threatened by human activities. With little attention paid to the waterfall as a source of a domestic water supply and tourist spot for recreation, this study was designed to investigate one of the waterfalls in Iligan City, Philippines: Dodiongan Falls. The location of the study is a neighborhood of the city garbage dumpsite that, due to an uncontrollable situation, releases dark-colored secretion from the treatment box as has been verified by the residents in the area; this posed a threat to their food security and livelihood. Assessing the physicochemical parameters, heavy metal concentration and Escherichiacoli counts is very crucial in interpreting its water quality. All parameters such as the pH, alkalinity, turbidity, lead (Pb), mercury (Hg), and the E. Coli test were done following the standard procedures. The results revealed that the pH, alkalinity, turbidity, total lead (less than 0.01 mg/L) and total mercury concentration (less than 0.001 mg/L) at the three sites were in conformity with the guidelines of the World Health Organization and Philippine national water quality standards. However, the E. Coli count has increased downstream from 220 to 1,600 MPNper 100ml, which exceeded the standard limit. With these findings, it is paramount that the creation of a management plan be initiated as soon as possible by the different governmental agencies in order to bring back the life of Dodiongan Falls.

### Keywords
Water Pollution, Environmental Risk, Health Risk, Water Quality Assessment

## Pardeep Kumar

Pardeep Kumar[1*], N P Butail[1], Arvind K. Shukla[2], Pratibha Thakur[1], Devanshi Baghla[1], Munish Kumar[1], Praveen Kumar[1], Deepika Suri[1] and Hemali Bijlani[1]

[1]Department of Soil Science, CSK HPKV, Palampur, India
[2]IISS, Bhopal, India

# Ensuring Food and Nutritional Security through Zn Supplementation

## Abstract

The COVID era has made everyone familiar with the significance of micronutrients, particularly zinc (Zn) in human health, being the most deficient micronutrient worldwide. North-West Himalaya (NWH) of India is agriculture dominant region, thus, the deficiency of Zn in soils is severely impacting the production potential of different crops but also impeding the nutritive value of the produce. Imbalanced and indiscriminate use of high analysis fertilizers by the farmers with none to negligible Zn application is the major reason for its deficiency in soils. Therefore, efficient Zn management is essential to achieve potential crop yields with higher nutritive value. Many reports have documented 10-31% yield enhancement of different crops to additional Zn application. From the field trial conducted at the sub humid mid hill region of NWH, the Zn application significantly improved the crop yields, system sustainability, DTPA-Zn, and different Zn pools without owing any environmental risk in maize-wheat system. Under similar agro climatic conditions, the economically optimal system productivity was obtained with 7.46 and 5.93 kg Zn ha$^{-1}$ for alternate and continuous frequency of Zn application, respectively. Whereas, in potato crop, Zn application significantly enhanced the potato tuber yield (14.4 t ha$^{-1}$) with two foliar sprays of 0.10% Zn through Zn metalosate, with highest ascorbic acid, protein, TSS, and micronutrient cations values. Also, the partial factor productivity, agronomic efficiency, agro-physiological efficiency, and apparent recovery efficiency ranged from 2.79-52.81, 0.41-5.16, 10.54-25.83, and 1.95-20.93 kg g$^{-1}$, with Zn at 0.025% through Zn metalosate(chelated product) recorded the highest values, respectively. To enchance the Zn content in crops, agronomic bio-fortification is the most viable and economical option. Further investigations are therefore needed to study the effect of Zn application with the availability of other nutrients, updating their pre-existing database, their environmental impact, and enhancing Zn use efficiency for different NWH regions.

## Keywords

Bio-fortification; Zinc; North-West Himalya; Mobility factor

## Biography

Dr. Pardeep Kumar is working in the field of Soil Science since 1998. He is a pioneer worker in the field of systematic micronutrient research and has contributed significantly in the field of soil fertility management in Himachal Pradesh by publishing a geo referenced Atlas on Micro and Secondary Nutrients' status. Besides, he standardized the management of Zn and B fertilization in

maize-wheat and cauliflower-tomato cropping systems in soils of Himachal Pradesh, respectively. Evaluated different sources of Zn and B for enhancing their use efficiencyin different crops. Has also identified micronutrient efficient genotypes of cereals and vegetables. He has published more than 85 peer reviewed research papers in International and National Journals of repute.

All the scientific findings are/will certainly be helpful in addressing the nutrient management issues for sustainable agriculture vis a vis environmental protection in vulnerable Himalayan ecosystem.

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## Chia-Ying Ko
Chia-Ying Ko ,Yin-Zheng Lai, Chih-Wei Tu &Chi-Yun Kuo

Institute of Fisheries Science, National Taiwan University, Taiwan

## Changes in Geographic Interactions of Fish Species under Climate Change

Abstract

Climate change and warming ocean temperatures are known to pose persistent threats to marine fish and their communities. Because climate change affects multiple ecological levels, understanding changes in interactions between species, and exploring impacts of climate change on species is still necessary. This study first used geographic overlaps as a way of inferring species interactions (even this method cannot fully infer that there must be actual interactions between species), to understand the possible interdependence of species, and further explore coexistence structure and stability of fish communities. Species robustness refers to the spatial influence of the target species on other species, while species sensitivity refers to the spatial sensitivity of the target species to other species. Our results showed that marine fishes had consistent and significant long-term changes in geographic interactions across latitudes. The size of species range and the ratio of species overlaps with other species affected species robustness and sensitivity, respectively. Species robustness and species sensitivity changed over time. The weakening of the negative correlations indicated that climate change might cause unstable community structure and interactions. The geographical overlaps with other species before warming had become an important correlations affecting species' geographic dependence. Moreover, distributional depth, body length, and maturity age were decisive factors for changes in the spatial sensitivity of species, and biomass and size of different fishes would change under different climate scenarios. Overall, changes from single species to community inconsistencies show the impacts and complexity of climate change on ecosystems, and the proportions of importantly commercial species in different sea areas would decrease over time, suggesting that fisheries changes in resources and structure.

## Keywords
Climate change, Geographic overlap, Species interaction, Species distribution, Fisheries resource

## Biography
Chia-Ying Ko is an associate professor at Institute of Fisheries Science, National Taiwan University, where she mainly researches on global change biology, biogeography, macroecology, big data and long-term data analysis, and interdisciplinary and transdisciplinary sciences. She graduated from the National Taiwan University, with PhD degree in Ecology and Evolutionary Biology. She experienced as a visiting scholar fellow and a postdoctoral associate at Stanford University and Yale University, USA, before moving back to Academia Sinica and National Taiwan University. She is also currently working on marine pollution, marine conservation, and fisheries management at large spatial scales to achieve the balance between humans and nature for sustainable development.

D. Sutrisno

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# Ecosystem-Based Coastal Management: Linking Ecosystem Risk to Change Adaptation

## Abstract

Climate change might have disastrous consequences on vulnerable coastal and marine ecosystems, as well as the community's welfare. 1.4 millimeters per year of the sea-level rise [1]alters the form of coasts, adds to coastal erosion, and causes flooding and increased subsurface salt-water intrusion. Coastal problems may be exacerbated by human socioeconomic activities, which tend to alter coastal ecosystems, particularly when the effects of climate change such as tidal waves and excessive rainfall are included. As a consequence, the coastal community's well-being will be threatened as well. Therefore, on the international, national, and local levels, there is a growing call for risk management utilizing ecosystem-based methods for climate change adaptation [2,1]. Relating to this issue, the purpose of this study is to investigate, the extent to which adaptation to the deteriorated coastal environment may be accomplished by using an ecosystem-based management approach and its economic valuation. The method will apply spatial planning analysis based on ecosystem adaptation and mitigation, as well as the environmental economic valuation, in order to assess community welfare in the context of ecosystem risk and management. As a case study, a coastal community in Sayung sub-district, Demak district, Indonesia, which is one of the places most impacted by floods owing to tidal flooding and land conversion, is used. The findings indicate that ecosystem-based mitigation and adaptation management, which includes hard and soft engineering, can contribute to the maintenance of human wellbeing. Using direct and indirect economic evaluation methods, the well-being of the populace is determined. The projection scenarios depicted in this study will encourage us to develop a better future strategy for balancing the social and economic existence of humans with the natural environment.

## Keywords

Climate Change, Environmental Risk, Tidal, Flooding, Adaptation, Mitigation

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## Biography

Dewayany Sutrisno is a research professor in the spatial information system in The National Research and Innovation Agency (BRIN), an adjunct lecturer at Post Graduate School of IPB University and lecturer at the National Training Center for International Geography Olympiad. Her research focuses on the geomatics and geosciences fields; Mulyanto Darmawan is a senior researcher at the National Research and Innovation Agency (BRIN). He has experience as a member of a geospatial task force team in Aceh during the 2004-2008 earthquake and tsunami, andas the director of the center for spatial mapping and atlas of the geospatial information agency; AtiRahadiati is a senior researcher at the National Research and Innovation Agency (BRIN) with the background in spatial information system, especially in climate and geosciences approach.

## Puneeta Pandey

Associate Professor, Centre of Environmental Studies
University of Allahabad, India

## Urban Heat Island for a Metropolitan and Semi-urban Site of India: a Local Level Climate Modification Phenomenon

### Abstract

Urban heat island (UHI) is one of the most alarming climatic changes caused by urbanisation and is therefore a major issue for environmentalists worldwide. The climate of urban areas may vary as a result of contributing causes to Urban Heat Island, including increasing industrialization, urbanisation, population growth, and changes in land use and land cover. Besides, urban geometry and sky-view factor play a key role in the formation of urban heat islands. Despite being a local occurrence, UHIs have the power to change the climate in nearby semi-urban areas as well as metropolitan areas itself. Hence, it becomes crucial to comprehend the fundamental mechanisms that lead to UHIs, how they worsen already-existing UHIs, and how to utilize mitigation techniques to stop them. Using thermal remote sensing and ground-based research, the current paper analyses the UHI creation in a metropolitan city and a semi-urban site in north-western India. Both diurnal and nocturnal heat island were studies in both the sites, so as to understand the causative factors that accelerate the formation of UHIs. The current work makes an effort to highlight the use of geospatial technology in investigating the phenomena of urban heat islands, which may be used by policymakers in urban planning and minimizing the UHI effect for cities to grow sustainably. Keywords: Climate Change, Urban Heat Island (UHI), Land Use Land Cover (LULC), Urbanization, Mitigation

## Debmita Bandyopadhyay

UiT The Arctic University of Norway and the Ministry of Earth Sciences, India

# Climate Impact on Himalayan Glaciers and the Alpine Vegetation

## Abstract

The increased availability of remote sensing platforms with an enhanced spatial and temporal resolution, combined with extensive global coverage, allows fast and cost-effective estimates of changes in glacier parameters over large areas. To understand the impact of the warming climate on natural resources, glaciers are an ideal subject because of their sensitivity to climate change. Himalayan glaciers, apart from the polar regions, form the largest cluster of snow and ice cover, and the meltwater from these Himalayan glaciers serve more than 800 million people downstream, making it a significantly vital resource to study. In the talk, various glacier properties like glacier extent, glacier volume, surface elevation change, and mass balance estimated over the Himalayas on a decadal scale will be presented. A detailed spatial variation of the Himalayan glacier mass changes in response of glaciers to climate variables will also be spoken about. This talk shall encompass studies on the interaction between the carbon, water, and atmosphere in terms of vegetation line dynamics in high - altitude Himalaya, glacier ice-mass loss, and the climate interactions in the region. Following three questions linked to the glaciers of Himalaya shall be addressed in the talk:

1. What is the ice-thickness and mass change in the Indian Himalaya over the past decade and how a high- resolution SAR data can interpret the heterogeneity in the mass loss in cloud-covered seasons?
2. How does the climate feedback accelerate glacier mass change on a regional scale?
3. Is the high-altitude vegetation in the glacier ecosystem changing in tandem with the glaciers' dynamics due to climate warming?

## Biography

Dr Debmita Bandyopadhyay is a researcher at UiT-The Arctic University of Norway. She has worked on glacier dynamics for the past six years. She did her PhD at IIT Bombay, India, and her thesis was to understand the climate impacts on Himalayan glaciers. She has expertise in handling multi-sensor remote sensing data and has worked extensively on glacier mass balance and velocity measurements using the InSAR technique. Currently, she works on avalanche monitoring and modelling using various meteorological and climate indicators at UiT. As a part of her postdoctoral research at the University of Cambridge, United Kingdom, she worked on vegetation dynamics in the Himalayan region. She has published in several top-tiered journals like Scientific Reports and Remote Sensing of the Environment. Dr Bandyopadhyay is a recipient of the Issac-Newton Trust grant from the University of Cambridge and has worked on interdisciplinary projects involving stakeholders from industry and researchers from academia.

Her talk at EnScience 2023 will highlight the recent advances in glacier studies in the Himalayas, focusing on glacier mass balance estimates and uncertainties.

## L. Primavera

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# Proper Orthogonal Decomposition Analysis of Turbulent Fields in Cyclones

## Abstract

In this work we present an application of the Proper Orthogonal Decomposition (POD) technique, a method for extracting turbulent structures from a spatio-temporal dataset of a scalar or vector field, to the effective temperature field of the cyclone Faraji [1], the first tropical cyclone of year 2021 that reached category 5, and to the Ianos mediterranean cyclone [2], that developed in 2020 in the middle of the Ionian sea, having much different intensities on the Saffir-Simpson scale.

For the Faraji cyclone, we use a time-series database of the effective temperature field collected by SEVIRI radiometer, onboard the Meteosat Second Generation - 11 geostationary satellite. For the Ianos cyclone, we used data obtained from LEO satellites. The capabilities of the VIIRS and MODIS sensors, on board the Suomi NPP and EOS-Terra/Aqua platforms, which have 2D images with high spatial resolutions, were exploited to get a quite detailed spatio-temporal evolution of Ianos' temperature field.

We use the POD to decompose those time-series databases. Through this approach, it is possible to decompose the original temperature field of the cyclone on an empirical basis, extracted from the data, which has the property of retaining the maximum possible energy of the original field. In this way, we can obtain information about the energy distribution of the turbulent structures of the temperature field inside the cyclone and we identify, both in Faraji and in Ianos, three different spectral regions of possibly different origin, which indicate that in general the evolution of turbulence inside a cyclone follows a rather regular dynamics in spite of the quite different intensities of the two cyclones. Moreover, the POD allows us to study the detailed temporal dynamics of each range of scales by reconstructing the field in each zone of the spectrum.

## Keywords
Proper Orthogonal Decomposition, Tropical cyclones, Medicanes.

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## E.Muteba

E.Muteba[1]and T. Kasanda[2]

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# Modelling Decision Support System for the Mitigation and Adaptation of Waste in Kinshasa City

## Abstract

There is a rapid rate of urbanization in the city of Kinshasa which has a visible effect on the accumulation of solid waste and the degeneration of the environment, forming indicators of the quality of sanitation in several municipalities. The management of waste become a challenge for the authorities. Kinshasa city solid waste management requires an innovative approach to changing their image and identity. We focus particularly on two categories of the waste sector, namely: Solid Waste Disposal Sites (SWDS) and Domestic wastewater (DWW). The system developed used the calculation methods of the 2 waste sectors proposed in the IPCC [1] and, the policy and the strategy defined in the sanitation sector through the development of a national sanitation plan [2].Our study proposes a decision support model based on series of mathematical functions [3, 4]that can monitor the mitigation and adaptation strategies for the waste sector.
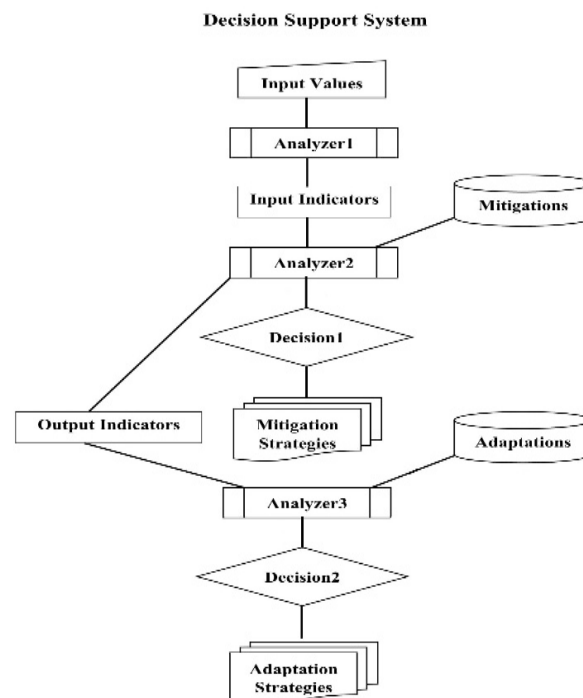
Such a system can help stakeholders to be involved with efficiency in their mission and provide an effective response to the current and future risks from waste sector in city of Kinshasa.

## Keywords

Waste sector, Mitigation, Adaptation, Modelling, Decision support system.

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## Biography

Eustache Muteba is an Academic researcher specialized in computer science with a particular interest in software engineering, artificial intelligence and medical informatics

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## C. A. Harguinteguy

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# Bioaccumulation of Heavy Metals and Emerging Contaminants by Macrophytes and their Potentiality in the Wastewater Treatment in Constructed Wetlands

## Abstract

Environmental protection has become a global problem, anthropogenic activities have led to the generation of greater negative impacts on the environment, causing pollution to affect people's health and environmental deterioration. Industrialization has systematically contributed to increasing emissions of heavy metals and emerging contaminants, with the consequent deterioration of the environmental quality.

The heavy metals and emerging contaminants concentrations in surface waters and sediments and their relationship with the accumulation and physiological changes in aquatic plants in areas with anthropogenic impact were evaluated. Different macrophytes revealed high capacity to accumulate those contaminants in their tissues, from contaminated water bodies. Thus, the manifestation of physiological changes demonstrated the importance in monitoring studies in aquatic environments with consequences of ecological risk [1].

However, the high accumulation levels of contaminants in tissue observed in some plants and the physiological tolerance, which revealed the potentiality for use in remediation systems with contaminated water and sediment. The exposure in constructed wetlands, simulating an aquatic environment contaminated with wastewater discharges, allows the evaluation of levels of bioconcentration, translocation and removal efficiency in these systems [2].

## Keywords

Macrophytes, Heavy Metals, Emerging Contaminants, Biomonitoring, Treatments, Constructed Wetland.

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## Biography

Carlos A. Harguinteguy is a Biologist and Dr. in Biological Sciences, both graduated from the Faculty of Exact, Physical and Natural Sciences (FCEFyN) of the National University of Córdoba (UNC), Argentina. He is Professor at the FCEFyN of the UNC and Associate Researcher of the National Council for Scientific and Technical Research (CONICET). He works in the Multidisciplinary Institute of Plant Biology of Córdoba, Argentina. His experience is based on the use of native macrophytes as bioindicator organisms of contamination by toxic compounds in aquatic ecosystems, by determining their accumulation capacity and degree of tolerance, and their implementation in constructed wetland systems that allow the removal of pollutants and nutrients in wastewater treatment.

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## Ashish Dubey
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## Response Surface Methodology Based an Experimental Approach for Biodiesel-Oxygenated Fuel Blends on Diesel Engine

### Abstract

To achieve the set targets for green energy, the role of bio fuels in the transportation sector is important. In the present study, the fuel blends were prepared with a mixture of biodiesel blend (B35) and diethyl ether (0–15% v/v) using response surface methodology at 15% EGR. The result showed that the blend B35 with 10% diethyl ether was found to be most suitable for agricultural-based diesel engine. The observation reveals that brake thermal efficiency, NOx emissions, and smoke emissions were improved by 6.6%, 8.8%, and 20.3%, respectively, as compared to base-line fuel (B35).

## Sewwandi Rathnayake

Texas A&M University, USA

## In-situ Stabilization of Arsenic in Highly Contaminated Soil Using Iron Rich Water Treatment Residuals

### Abstract

Arsenic (As) is a common soil contaminant, despite its natural occurrence various anthropogenic sources have contributed high concentrations in the soil. The efficacy of in situ fixing of arsenic (As) using iron rich drinking water treatment byproducts (Fe-WTR) was examined using chemical extractions for lability, bioavailability, and bio accessibility accompanied by spectroscopic verification.The test soil originated from a former smelter site in Utah with total of 66,400 mg/KgAs concentrations. The Fe amendments were added in Fe/As molar ratios ranging from 1:1 to 1:10.Speculation that the efficacy of Fe-WTR as an in situ immobilizing agent was due to the presence of high surface area and highly reactive, poorly crystalline Fe oxides was supported by spectroscopic analyses. Fe-WTR has proved a practical remediation approach to soils contaminated with as while encouraging re-use of Fe-WTR as a sustainable amendment.

### Biography

Sewwandi Rathnayake is a Schlumberger Faculty for Future Fellow and received her PhD in soil chemistry at Texas A&M University, College Station. Her dissertation research study focused on investigating iron rich drinking water treatment byproducts as soil amendments for remediating arsenic and other trace elements in soil. Prior to that, she earned her master's degree in Plant and Soil Sciences at University of Kentucky, Lexington. Her project focused on transformations, bioavailability and toxicity of ZnO nano material in waste water. She earned her bachelor's degree in Agriculture at University of Peradeniya, Sri Lanka. She worked as an Associate Director, Environmental Science for Houston Wilderness and currently working as a Freelance Environmental specialist and also as an Adjunct faculty at Lone Star College. Her work published in several highly rated peer-reviewed journals, local and international conferences and symposiums.

## Ruben Rodriguez Elizalde
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## Use of Rpas (Drones) for Masonry Arch Bridges Inspection: Quality and Sustainable Work with Preventive Guarantee

### Abstract

Using of remotely piloted aircraft system (RPAS), better known as drones, has spread with multiple and very diverse applications on last years. It includes civil engineering structures inspections. Starting from several real structural inspections of masonry arch bridges, this conference was born. The inspections were conducted by the author experimentally, in order to demonstrate that the aircraft can serve as a quality tool to make this work that is being carried out by qualified personnel and expensive auxiliary means currently. At the end, the author tryes to demonstrate that we can obtain identical or even better quality results, reducing the health and safety risks for the workers who do that work, with time and costs significant savings.

### Keywords

Drones, Heritage Buildings, Bridge Inspection, Structure.

### Biography

Rubén Rodríguez Elizalde is Geologist and Civil Engineer, PhD in Architecture and Heritage and Senior Occupational Health and Safety Degree. On professional level, he is specialized in pathology and structural rehabilitation. In addition, he has carried out preventive management tasks, fundamentally in construction, metal and entertainment sectors for the last fifteen years: he has worked as execution director, health and safety coordinator on project phase and health and safety coordinator on execution phase. In this sense, he has been health and safety coordinator of great renown works in Spain. Currently, he is a professor at various university centers, such as European University of Madrid or Universitat Oberta de Catalunya (UOC). In addition, he is Member of the National Association of the Technical Inspection of Structures in Spain, member of the Geology Applied to Engineering Spanish Association and member of the International Association for Engineering Geology and the Environment. In addition, he is Technical Director at EIP, company specializing in structural rehabilitation and prevention management in the construction sector. As a final anecdote, it should be noted that Rubén is a Remote Piloted Aircraft (RAP) Pilot and a Pilot Instructor and Examiner. That is why he can talk us about both aspects fusion: he can talk about the application and use of drones for monitoring construction structures.

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