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World Congress on

EARTH SCIENCE, CLIMATE CHANGE, RECYCLING, AND WASTE MANAGEMENT

March 24-25, 2025 | Barcelona, Spain

Hosted By:
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SCIENTIFIC PROGRAM

Day 01 | March 24, 2025 | Barcelona, Spain

08:30-09:30 **Registrations**

09:30-09:40 **Opening Ceremony**

Keynote Forum

09:40-10:15 **Title: Landscapes of sandy areas along a rainfall gradient of 90-450 mm average rainfall**

Aaron Yair, Hebrew University, Israel

10:15-10:50 **Title: Global warming's "Six Americas" in agriculture: Exploring farmers' attitudes towards climate change and adaptive and mitigative responses**

J Gordon Arbuckle, Iowa State University Department of Sociology, USA

Refreshments Break @ 10:50-11:10

Speaker Session:

Session Chair: J Gordon Arbuckle, Iowa State University Department of Sociology, USA

11:10 - 11:35 **Title: Vulnerability, robustness and sustainability of the operation of the wastewater treatment plant and its importance for the circular economy in the light of climate change**

Vesna Mislej, Jp Vodovod Kanalizacija Snaga, Slovenia

11:35 - 12:00 **Title: Analysis of forest loss in the amazon region from 1990 to 2020 using remote sensing data**

Tiago Goulart, Earthworm Foundation, Brazil

12:00 - 12:25 **Title: DRAIN Project: An integrated urban drainage model in QGIS with IBER-SWMM**

Namrata Karki, BGEO, Spain

12:25 -12:50 **Title: Enhancing trommel screen efficiency in waste management using discrete element method (DEM)**

Raul Soriano, Instituto Tecnologico de Aragon, Spain

Lunch and Networking Break @ 12:50-13:40

Speaker Session:

Session Chair: Johannes Leis, Sächsisches Textilforschungsinstitut eV Chemnitz (STFI), Germany

13:40-14:05 **Title: Topics, trends and perspectives in the research and development on textile circularity**

Johannes Leis, Sächsisches Textilforschungsinstitut eV Chemnitz (STFI), Germany

14:05-14:30 **Title: Sustainable reuse of lead-acid battery waste for perovskite optoelectronics and solar cells**

Mariana Berruet, National University of Mar del Plata, Argentina

14:30-14:55 **Title: Increasing recycled content in circular knitted fabrics with corizon technology**

Henrike Schmitz, Technische Universität Chemnitz, Germany

14:55-15:20 **Title: Footwear recycling pilot plant as sustainable solution and clean technology for the industry**

Borja Mateu Romero, INESCOP, Spain

15:20-15:45 **Title: Problems and solutions for mechanical recycling of mixed fiber waste from knitted used textiles**

Magdalena Kohler, Technical University Chemnitz, Germany

Refreshments Break @ 15:45-16:05

16:05-16:40	**Title: Recovery of rare earth elements for environmental catalytic applications** **Maria Teresa de Jesus Simoes Campos Tavares,** University of Minho, Portugal **Antonio Jose Guerreiro de Brito,** University of Lisbon, Portugal
16:40-17:05	**Title: Carboneus and magnetic nanomaterials for oil/hydrocarbons removal from water** **Thamer Adnan Abdullah,** University of Technology, Iraq

Panel Discussions & B2B Meeting

Day 01 End | Closing Ceremony

Day 02 | March 25, 2025 | Barcelona, Spain

08:30-09:30 : Registrations

09:30-09:45 : Opening Ceremony

Speaker Session

Session Chair: J Gordon Arbuckle, Iowa State University Department of Sociology, USA

09:30-09:55	**Title: Project agro2circular and how delamination recycling enables a closed loop recycling of packaging** **Julien Davin,** Saperatec GmbH, Germany
09:55-10:20	**Title: Beyond Data: The Power of Storytelling to Drive Ocean and Climate Action** **Neus Figueras,** ICM-CSIC, Spain
10:20-10:45	**Title: Impact of drip emitter configuration on irrigation efficiency and soil water isotope ratios in a hazelnut orchard** **Firas Al Oqaili,** University of Technology, Iraq

Refreshments Break @ 10:45-11:05

11:05-11:30	**Title: Oxidative liquefaction as a sustainable recycling approach for polymeric waste: Process optimization and valorization of wind turbine blades, personal protective equipment, solar panels, and municipal solid waste** **Hamza Mumtaz,** Silesian University of Technology, Poland
11:30-11:55	**Title: End-of-life reverse osmosis membranes: Waste minimization and recycling** **Hiren D Raval,** Central Salt and Marine Chemicals Research Institute, India
11:55-12:20	**Title: Importance of mapping in the analysis of climate change risk impacts and the pathways to resilience** **Marta Henrich Grino,** Anthesis, Spain
12:20-12:45	**Title: Recent climate change forcings on coastal upwellings and artisanal fishery of Sardinella aurita in Venezuela** **Alexis Bellorin,** National Fisheries and Aquaculture Research Center (CENIPA), Venezuela
12:45-13:10	**Title: From Science to Action: Youth Advocacy and Research for Effective Climate Change Policies** **Andrea Bigorra,** University of Barcelona, Spain

Panel Discussions & B2B Meeting

Day 02 End | Closing Ceremony

Lunch and Networking Break @ 13:10-13:50

Day 02 | March 25, 2025 | Virtual | GMT+1	
Keynote Forum	
14:00-14:25	**Title: A framework of recycling and waste management for establishing a resource circulation society** **Dai-Yeun Jeong,** Director of Asia Climate Change Education Center, South Korea
14:25-14:50	**Title: Objectives and methods of battery recycling: A comprehensive overview** **Roger Achkar,** Global Waste Cleaning Network (GWCN), UK
Speaker Session:	
Session Chair: Roger Achkar, Global Waste Cleaning Network (GWCN), UK	
14:50-15:15	**Title: Management of waste from post-consumer wind power farms in the brazilian scenario** **Erika Alves Tavares Marques,** Universidade Federal de Pernambuco, Brazil
15:15-15:40	**Title: Wind farm decommissioning stage in Argentina** **Maria Pia Di Nanno,** National Technological University, Argentina
15:40-16:05	**Title: Unpacking paper's potential** **Clara Navarro Veiga,** DS Smith, United Kingdom
16:05-16:30	**Title: Measuring circular economy in cities** **Portia M Sinnott,** MS+ and Springloop Coöperatie UA, USA
16:30-16:55	**Title: Adopting nature-based solutions to avoid the tipping point in the Amazon** **Carlos A Nobre,** University of Sao Paulo, Brazil
E-Poster Presentation	
16:55-17:20	**Title: Extreme Value Distribution of Sea Level and Statistical Estimation Theory: An Application to the Alboran Sea** **Jose Juan Alonso del Rosario,** University of Cadiz, Spain
17:20-17:45	**Title: Effects of maize stalk and farmyard manure compost application on rice productivity and soil properties** **Sabeela Yaqoob,** University of Agriculture, Pakistan
17:45-18:05	**Title: Analysis of the flooding of coastal areas caused by climate change. Practical case on beaches in the provinces of Cadiz and Malaga** **Antonio Contreras de Villar,** University of Cadiz, Spain
18:05-18:30	**Title: Modifications in the phytochemical composition of broccoli in response to different growing temperatures** **Ivana Sola,** University of Zagreb, Croatia
18:30-18:55	**Title: Phytochemical resilience and bioactivity of broccoli in response to temperature stress: Susceptible** **Ivana Sola,** University of Zagreb, Croatia
18:55-19:20	**Title: Sustainable energy production from brewery solid wastes** **Vasileiadou Agapi,** University of Thessaly, Greece
Panel Discussions & B2B Meeting	
Day 02 In-person End | Closing Ceremony	

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KEYNOTE SPEAKERS Day 1

Aaron Yair
Hebrew University, Israel

Biography

Aaron Yair has completed undergraduate studies (Geography) at the University of Paris (Sorbonne). Graduate and PhD studies (Geomorphology) at the Hebrew University of Jerusalem (Summa cum laude). He is mainly interested in the study of geomorphic processes in arid and semi-arid environments. His studies cover the three prevailing landscapes in dry-land areas: rocky areas; sandy areas and loess covered areas. In 1972, he established the long-term Sede Boqer Research Station, characteristic of an arid rocky area. In 1999, he established (in the frame of the Minerva Organization, the Arid Ecosystems Research Centre, in the Nizzana area. This site represents a sandy ecosystem. The studies were conducted along a rainfall gradient from 90-450 average annual rainfall, focusing on the hydrology and ecology of the various sandy areas.

Landscapes of sandy areas along a rainfall gradient of 90-450 mm average rainfall

Dryland areas are regarded as highly sensitive to climatic changes. A positive relationship between average annual rainfall, and environmental factors (water availability, species diversity, etc.), is often assumed for areas with an average annual rainfall of 100-400 mm. However, the global climatological models fail to address an important issue. The above assumption disregards the fact that climate change in some dry-land areas is not limited to climatic factors. It is often accompanied by a pronounced variability in surface properties, such as the deposition of loess in a wet climatic phase, and of sand during a dry climatic phase. Needless to say, the spatial variability of the new surface properties may have variable effects on water resources and related environmental variables. In addition, the climatic models, based on average annual rainfall, disregard the rainfall characteristics at the rain-shower level, which greatly influence the degree to which rainwater will percolate, or will be transformed into runoff, thereby significantly affecting the spatial redistribution of water resources. In other words, climate change in dryland areas would be expected to have differential hydrological effects in a sandy area, a rocky area, or in a loess covered area. Differential spatial hydrological effects would be also expected within each of the areas listed above. The present work deals with the complex relationships between average annual rainfall, and environmental variables in sandy areas, at three research sites, along a rainfall gradient of 90-450 mm, in the south eastern Mediterranean area. Data obtained clearly show that average annual rainfall is not a good indicator of water resources and ecosystem properties. The controlling factors vary from one site to another.

J Gordon Arbuckle
Iowa State University Department of Sociology, United States

Biography

Dr. J. Arbuckle is a Professor of Rural Sociology and holds the prestigious Henry A. Wallace Endowed Chair for Sustainable Agriculture at Iowa State University of Science and Technology. He also serves as a faculty member in both the Graduate Program in Sustainable Agriculture and the Center for Agricultural and Rural Development. With extensive experience in agricultural research and policy development, he plays a pivotal role in bridging the gap between research, rural communities, and sustainable agricultural practices.

Global Warming's "Six Americas" In Agriculture: Exploring Farmers' Attitudes Towards Climate Change and Adaptive and Mitigative Responses.

Agricultural production in the Midwest region of the U.S. faces pressure to adapt to the negative impacts of climate change (e.g., extreme precipitation, increased frequency of drought) and to reduce greenhouse gas emissions from farming activities. Research has found that farmer attitudes toward and concern about climate change are highly variable and heterogenous, which presents challenges to outreach professionals that aim to tailor education and messaging to promote climate action on farms. To explore variation in attitudes towards global warming and climate change, we have utilized the Six Americas Super Short Survey (SASSY), a four-item questionnaire and typology method that segments individuals into six "types" based on their climate change beliefs and attitudes, with 1,095 Iowa farmers. This novel application of the SASSY typology method among an agricultural population found that 22% of farmers aligned with the dismissive type, 20% were doubtful, 7% were disengaged, 23% were cautious, 16% were concerned, and 12% were alarmed. To further investigate differences between types, we also explored variation in farmers' attitudes towards agricultural impacts and risks; we find that the SASSY, which is measured using general attitudinal items, is useful for understanding differential attitudes towards more specific agricultural issues as they relate to climate change. We also present recommendations for future research that may employ the SASSY among farmers and other agricultural populations.

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SPEAKERS Day 1

Vesna Mislej
Jp Vodovod Kanalizacija Snaga, Slovenia

Biography

Mislej Vesna graduated in 1984 on the University of Ljubljana, Faculty of Chemistry and Chemical Engineering, with the theme from the field of environmental technologies. Throughout her career she deals with the issue of environmental protection. For many years she worked in the field of testing drinking water, wastewater and sewage sludge, whereby gained a lot of experience in terms of managing the quality system in accordance with technical standard ISO/IEC 17025. As an operator - process technologist she has extensive experience in the management process for biological treatment of wastewater and sewage sludge management.

Vulnerability, Robustness and Significance for The Circular Economy of Wastewater Treatment Plants in The Light of Climate Change

The perceived climate changes and the pursuit of circular economy strategies force the operation of urban wastewater treatment plants (UWWTPs) to adapt to those new challenges. UWWTPs are becoming essential stakeholders in sustainable chains in establishing renewable energy schemes, obtaining critical raw materials from renewable material sources, and reusing treated municipal wastewater. In general, UWWTPs are the fingerprint of its catchment area and a reflection of the development of the local area and the advanced projects of the owner and operator of the sewage network of the urban agglomeration, which are the basis for their resistance to climate change. The EU UWWTD Recast (UWWTDR) [1] covers all three mentioned aspects of the circular economy – energy self-sufficiency, phosphorus and nitrogen recovery and more comprehensive reuse of treated municipal wastewater to prevent water scarcity [2]. The UWWTDR emphasizes that the urban wastewater treatment sector must play an essential role in reducing greenhouse gas emissions and helping to achieve the goal of climate neutrality, and introduces an energy neutrality goal (20% by 2030 and 100% by 2045) [2]. Monothermal processes (incineration/pyrolysis) of sewage sludge pellets (anaerobically decomposed and pelletized excess sewage sludge) are an essential stakeholder of renewable energy sources and critical raw materials. Based on laboratory experiments, pilot plants and full-scale data [3], the present study evaluates topics that represent some of the critical role of UWWTPs - energy recovery and material utilization of thermal residues. A case study presents the Central Wastewater Treatment Plant Ljubljana (CWWTPL) [4], its vulnerability and, at the same time, the robustness of aquatic biomass and efficiency of mechanical equipment for municipal wastewater treatment in the situation after the extensive flooding in August 2023 [5], when a significant impact of the flooding on the quality of the activated sludge in the waterline and its vulnerability and renewable capacity were detected.

Tiago Goulart
Earthworm Foundation, Brazil

Biography

Tiago Goulart is a researcher specializing in remote sensing and environmental analysis. With a background in geography and GIS, Tiago Goulart has contributed to several projects focused on land cover change and environmental conservation. Currently, Tiago Goulart is engaged in studying deforestation trends and their implications on biodiversity and climate change in the Amazon region.

Analysis of Forest Loss in the Amazon Region from 1990 to 2020 Using Remote Sensing Data

This study provides an in-depth analysis of forest loss in the Amazon region over three decades, from 1990 to 2020, utilizing remote sensing data from the Mapbiomas platform - Collection 5, and country boundaries sourced from the IBGE website. The primary objective was to quantify the extent of deforestation, identify the areas with significant forest transitions, and evaluate the overall impact on the Amazon's forest cover. The methodological approach involved reclassifying raster data for the specified years using Python scripts to determine forested and non-forested areas. Subsequently, we assessed changes in forest cover across Bolivia, Brazil, Colombia, Ecuador, Guyana, French Guiana, Peru, Suriname, and Venezuela. The results indicated that Brazil experienced the highest gross forest loss throughout the period, while Venezuela's forest areas remained the least altered. Notably, Ecuador demonstrated the highest percentage of forest transition, with 5.46% of its 2020 forest area undergoing reforestation or natural restoration. Our analysis revealed that the Amazon region saw a 7.74% reduction in forest cover, which increases to 9.91% when focusing on pristine forest areas between 1990 and 2020. The periods with the most significant forest losses varied by country, with the initial and final decades generally showing the greatest declines. However, Suriname exhibited its most substantial forest loss during the second decade. These findings underscore the critical state of forest loss in the Amazon and highlight the varying impacts across different countries. The insights gained from this study are essential for informing conservation efforts and policy-making aimed at preserving this vital global resource. Biography: Tiago Goulart is a researcher specializing in remote sensing and environmental analysis. With a background in geography and GIS, Tiago Goulart has contributed to several projects focused on land cover change and environmental conservation. Currently, Tiago Goulart is engaged in studying deforestation trends and their implications on biodiversity and climate change in the Amazon region.

Namrata Karki
BGEO, Spain

Biography

Namrata Karki is a Civil Engineer from Nepal specializing in hydropower and water resource management. A recipient of the prestigious Erasmus Mundus Scholarship, she earned her MSc in Flood Risk Management through a collaborative program at TU Dresden, IHE Delft, Universitat Politècnica de Catalunya, and the University of Ljubljana. This multidisciplinary program equipped her with advanced skills in hydrological modeling, urban drainage optimization, GIS applications, and innovative water resource and flood risk management strategies, aligning her expertise with global climate resilience challenges.

DRAIN Project: An Integrated Urban Drainage Model in QGIS with IBER-SWMM

Introduction: Urban flooding has been a worldwide catastrophic disaster due to increased urbanization, reduced infiltration capacity and climate change. With exceptional higher intense rainfall occurring in short intervals of time, cities experience pluvial and flash floods. This has led to the deterioration of the drainage systems demanding a proper study of the behavior of the water in the drainage network combined with the stormwater runoff. A combined model of IBER and SWMM has been proposed to understand the Combined Sewer Overflows (CSO) in the network system. The DRAIN Project (Digital RAIN) is a research project which comprises of developing an integrated urban drainage model capable of modelling surface stormwater (2D) with hydraulic modeling through conduits and channels (1D). By combining the calculation methodology of IBER with SWMM, a tool has been structured to operate utilizing the advantages of both powerful tools on a GIS interface.

Methodology: A QGIS plugin for the 1D/2D modeling is available named "DRAIN", which creates a GeoPackage format spatial database when started. This database is designed to support both SWMM and IBER models while offering improved user experience. The GIS layers are linked via foreign keys to ensure reliable data management, supported by functions and triggers. For a 1D/2D simulation, input data includes SWMM elements such as junctions, spillways, outfalls and IBER-specific layers such as DEM, surface layer etc. which can be imported via an INP file and GIS techniques respectively. The plugin enables the user to seamlessly conduct simulations by integrating both IBER and SWMM based on the prepared GIS data and an automatically generated mesh. The mesh is developed using the Frontal-Delaunay algorithm incorporated in the plugin itself.

Results and discussion: The model results are presented into two sections: surface results and drainage network results. Users have the flexibility to customize the output and open them from both IBER and SWMM interface. This allows the user to consult the entire set of calculated results. The plugin allows the users to effectively visualize the hydraulic results (depth and velocity) with desired timestep and their corresponding maximum value as shown in figure below:

Conclusion: This abstract outline the integration of the high-resolution dual drainage IBER-SWMM within the QGIS interface via an open-source plugin. This tools offers a comprehensive solution for modeling drainage water dynamics from both stormwater runoff and sewer network.

Raúl Soriano
Instituto Tecnológico de Aragón, Spain

Biography

Raúl Soriano Graduated with a Bachelor's and Master's degree in Mechanical Engineering from the University of Zaragoza. He is currently pursuing a PhD in Mechanical Engineering at Technological Institute of Aragon ITA, specializing in Discrete Element Method (DEM), fluid mechanics, and reduced-order modeling.

Enhancing Trommel Screen Efficiency in Waste Management Using Discrete Element Method (DEM)

Nowadays, Waste Management is one of the main topics in academic research, driven by the increasing need for sustainable solutions to handle global waste production. Trommel screens are widely used in Waste Management Plants as a first stage to separate materials based on size. However, the uncertainty in waste shapes, sizes, and material properties induces difficulties in accurately estimating the correct efficiency in this industrial field for the trommel. Discrete Element Method (DEM) is a numerical simulation technique used to model and analyze the behavior of discrete particles, providing a robust approach to understanding complex material interactions. Despite using the hypothesis that waste particles are spheres, in this study, DEM is employed to demonstrate that this kind of simulations could be used to enhance the performance of a trommel in Waste Management. Various parameters have been studied to investigate the operational conditions. The simulation parameters include changes in the bulk density of the different materials, operation time, mass flow rate, rotational speed, and the inclination of the trommel. The findings reveal how these features influence the efficiency of the three exit mass fluxes of the trommel for different materials, offering a comprehensive view of its performance. The results stand out the value of DEM in capturing dynamics that affect screening efficiency and segregation, enabling a better understanding of trommel behavior. Moreover, this study underscores the role of computational modelling as a cost-effective alternative to physical experiments. These outcomes not only inform optimization strategies for existing systems but also provide a foundation for designing innovative trommel solutions. This work has been supported by the Project "Desarrollo sobre tecnologías digitales aplicadas a procesos de tratamiento de residuos. "DIGITAL WASTE", expedient n. CPP2022- 010022, approved by the Investigation Nacional Agencia (AEI), Ministry of Science, Innovation and Universities, under the Program Proyectos de I+D+i en Colaboración Público-Privada 2022 under the frame of the Plan de Recuperación, Transformación y Resiliencia. CPP2022- 010022 / AEI/10.13039/501100011033 / Unión Europea Next Generation EU / PRTR.

Johannes Leis
Sachsisches Textilforschungsinstitut e.V. (STFI), Germany

Biography

Johannes is working at STFI since 2018, first as a working student and since 2020 as a Research Associate. He is focusing on the optimization of mechanical recycling technologies and the therefore needed input composition, the design for and design with recycling. He is a member in a number of masterclasses, innovation hubs and standardization committees on innovation in circular and/or biobased textiles. Furthermore, Johannes is giving lectures at the TU Dresden, the TU Chemnitz and the Kunsthochschule Berlin Weißensee on textile waste management systems and textile recycling.

Topics, Trends and Perspectives in the Research and Development on Textile Circularity

The presentation will provide an overview of various current research projects from the Sächsisches Textilforschungsinstitut Chemnitz e.V. (STFI) and its partners in the fields of the textile circular economy and textile recycling. The three projects presented deal with different problems, specifically with:

- The recycling of polyester and cotton textiles (PESCO-UP),
- The recycling of carbon and glass fiber reinforced plastics (MC4),
- Possible recycling strategies for regional textile waste (TRICYCLE).

In the European project **PESCO-UP**, the consortium develops solutions for the chemical recycling of textile products made of Polyester and/or Cotton. After the chemical recycling processes, the fibers are characterized, spun into yarns or processed to nonwoven demonstrators. The project started on January 1st 2024 and the most recent results will be presented.

The European project **MC4** deals with recycling strategies for glass fiber and carbon fiber reinforced products. Throughout the project the adaption of a reshapeable Epoxy resin, the reuse of glass fiber composites after shredding and the chemical and mechanical recycling of carbon fibers after their use in composites have been developed. The three year project runs until the end of March 2025 so the presentation will contain the final results.

In the national project **TRICYCLE** the consortium developed a recycling center concept to enable a regional circular economy in which even small quantities can be recycled, for which there is currently no recycling solution due to the lack of volume. The concept developed includes the collection and initial treatment of waste in order to define and prepare the best possible recycling options. It is also planned to engage networking and education on possibilities for textile recycling for all the different stake holders. The project hast recently ended so the final results will be presented.

Mariana Berruet
National University of Mar del Plata, Argentina

Biography

Dr. Mariana Berruet is a senior researcher at the National Scientific and Technical Research Council (CONICET) and a faculty member at the Engineer Faculty of the National University of Mar del Plata, Argentina. She works in the Institute of Materials Science and Technology Research in the Electrochemical Area. Her scientific career focuses on the investigation of materials for energy applications. She has expertise in the development of materials for third-generation photovoltaic energy, utilizing simple methods with potential for industrial applications. She is currently researching advanced materials derived from hybrid halide perovskites, focusing on their applications in photovoltaic solar energy, energy storage, and efficient energy utilization in resistive memory systems. She emphasizes recycling methods and the reuse of metal waste for energy production in her persistent search for sustainable development solutions.

Sustainable Reuse of Lead-Acid Battery Waste for Perovskite Optoelectronics and Solar Cells

Despite strict regulations about the use of lead in several countries, large amounts of waste lead-acid batteries are generated worldwide every year, seriously polluting the environment and constituting a persistent threat to human health. In this study, we focus on redirecting an existing industrial method for the recovery of battery-waste lead towards a new material of better environmental value, namely in perovskite for solar cells. This approach not only mitigates the environmental impact of lead waste but also contributes to the circular economy by integrating recycled materials into cutting-edge photovoltaic technologies and regulating the proliferation of lead mineral extraction. We adopted a process to turn recycled lead into optoelectronic-grade lead iodide (PbI2) using different recrystallization methods. We then showed that the quality of the perovskite films meets the quality requirements for optoelectronic and photovoltaic devices. The films were characterized and found to have similar photoluminescence emission and ambipolar diffusion lengths, when compared to films obtained from commercial PbI2 precursor. This indicates that battery waste can be incorporated as a precursor to manufacture optoelectronic devices. We thus prepared test solar cells, and the output characteristics of cells made with commercial and recycled PbI2 were similar. They reached open-circuit voltages above 800 mV, a value indicating high quality films considering that the cell test structures lacked a hole-transport layer. These results highlight the effectiveness of the adopted purification and synthesis methods, enabling the use of recycled lead to produce perovskite materials without sacrificing performance. Based on the discussed results, new challenges emerge, such as the need to study in depth the various types of defects created in the perovskite to enhance its competitiveness against commercial ones under service conditions. Moreover, considering the success of upcycling, there is potential to incorporate an additional recovery material, such as cesium, into the production chain of solar perovskites.

Henrike Schmitz
Technische Universität Chemnitz, Germany

Biography

Henrike Schmitz is an artistic associate at University of Art and Design Halle. Before that she gained important experience as an engineer at SOEX Textil- Verwertungsgesellschaft m.b.H, which strongly influenced her research approach in the field of circular knitting and strategies for recycled content and recyclable products. Besides that, she maintains a network with industrial partners, institutions and collaborators along the textile chain.

Increasing Recycled Content in Circular Knitted Fabrics with Corizon Technology

Incorporating mechanically recycled waste fibres into new knitted fabrics is challenging due to the short length of fibres after the tearing process, making them difficult to spin into high-quality yarns. OE spinning results in yarns that are hard, grainy, and unsuitable for clothing. This research explores the Corizon process, developed by Terrot, which combines yarn spinning and knitting. This method allows for a higher recycled content in circular knitted fabrics while maintaining a softer, more refined feel compared to traditional methods. The Corizon system feeds the intermediate yarn product directly into the knitting machine, producing yarn immediately before the meshing process. This integration potentially improves the starting point for subsequent recycling processes, as the fibres do not need to be separated from a tightly twisted yarn composite. The Corizon technology offers various twisting levels, allowing material combinations of core and sheath from different materials. This flexibility adjusts the softness and enhances the recyclability of the knitted fabrics compared to conventional methods. The study hypothesizes that this process can produce higher quality recycled content fabrics with better feel and increased recyclability.

Borja Mateu Romero
INESCOP, Spain

Biography

Borja Mateu is an experienced researcher in eco-design, life cycle analysis, and circular economy. He is Circular Economy Project Manager at INESCOP, where he leads national and European R&D initiatives, focusing on life cycle assessment, carbon footprint calculation, eco-design, and waste management. He has designed and launched the first mechanical recycling plant for footwear. Borja holds a master's degree in Environmental Engineering and is currently pursuing a Ph.D. in Environmental and Sustainability at Universidad Miguel Hernández de Elche, specializing in circular economy models for the footwear industry.

Footwear Recycling Pilot Plant as Sustainable Solution and Clean Technology for the Industry

As a successful project, a semi-industrial plant has been designed, built, and set up to transform footwear waste through mechanical recycling in order to obtain products with a low environmental impact as a component of footwear, urban furniture, pavement, insulation, non-woven textiles, shock-absorbing playground and gym flooring, or other applications.

The pilot plant offers a sustainable solution to the large amount of waste from the footwear industry. So far there is no other alternative to landfilling or incineration, and thus this solution contributes to a circular economy business model. Considering that footwear is a multi-composition waste that is difficult to manage, as it can even be made up of more than 40 different materials, hence the difficulty of the machinery and the success of this project. The process begins by crushing and grinding the entire shoe, and then the main materials are sorted separately: leather, polymeric materials (PU, PVC, rubbers, thermoplastic rubbers), textiles, foams, metals (ferrous and non-ferrous), etc.

Magdalena Kohler
Technical University Chemnitz, Germany

Biography

Magdalena Kohler is a senior guest lecturer with a background in fashion design at the University of the Arts in Berlin and PhD candidate focusing on sustainability, circularity, and recycling processes. She is currently pursuing a PhD at the Technical University Chemnitz, researching the wool fiber cycle for clothing textiles from a holistic view. In her work, she analyses the sorting, cutting, and tearing process of post-consumer waste, with the goal to improve recovery procedures for mixed fiber waste from knitted textiles. She collaborates with industry partners and research institutes along the textile supply chain.

Problems and Solutions for Mechanical Recycling of Mixed Fiber Waste from Knitted Used Textiles

Pure new wool is rarely found as a quality in used clothing sorting plants. On the other hand, large quantities of synthetic fiber-wool blends accumulate as a waste product of the fast fashion industry. Multiple blends lead to a high loss of value. My previous research has shown that fiber blends with up to seven different fibers are in circulation within one garment. These qualities are mainly used as filling and insulation material. In order to achieve the recyclability of these fibers for the clothing sector, two essential areas of mechanical recycling are analyzed and modified.

The planned sorting of knitted used clothes is based on material composition, stitch geometry and yarn twist. The resulting fine sorting, as well as the subsequent cutting and tearing process, have a significant influence on the fiber resolution of the textile surface, as well as on a process-stable yarn production. Preference groups are defined using manual and AI-based sorting systems. The cutting and tearing process of these fiber blends presents challenges that prevent further yarn production. To preserve the existing fiber qualities and lengths as far as possible, the tearing process was evaluated and ruled out if it´s still necessary, by a modified cutting process. The cut textiles are dissolved directly on the carding machine down to the fiber level. These steps have a direct impact on the rest of the textile chain in the recycling sector and are essential for the more strongly promoted circularity in textile recycling in the future.


Maria Teresa de Jesus Simoes Campos Tavares[1] and Antonio Jose Guerreiro de Brito[2]
[1]University of Minho, Portugal
[2]University of Lisbon, Portugal

Biography

Maria Teresa de Jesus Simoes Campos Tavares Biography:

Teresa Tavares graduated in Chemical Engineering at University of Porto and started her professional career as production engineer at the national petrochemical industry. She moved to academia and jointed University of Minho as lecturer in Chemical and Biological studies while finishing her PhD project in Bi-metallic Catalysts for SNG Production, partially developed at Haldor-Topsøe A/S, in Denmark. Her present interests are biosorption systems for resources recovery, rehabilitation of contaminated systems, environmental catalysis and sustainable nanocatalysts. She published more than 100 peer reviewed papers and supervised more than 20 PhD projects.

Antonio Jose Guerreiro de Brito Biography:

António Guerreiro de Brito is a Full Professor of Environmental Engineering at the Instituto Superior de Agronomia, University of Lisbon. He holds a degree in Environmental Engineering from NOVA University of Lisbon, a PhD in Chemical and Biological Engineering from the University of Minho, and a Habilitation from NOVA University of Lisbon. A member of the LEAF research center and the Associated Laboratory TERRA, his research focuses on wastewater treatment, bioenergy, water resource management, and sustainability assessment. He has held leadership roles, including President of the Instituto Superior de Agronomia's Management Council (since 2018), Director of Water Resources in the Azores, and President of the College of Environmental Engineering (2007–2013). Prof. de Brito is also a dedicated lecturer and an expert in environmental engineering and sustainability.

Recovery of Rare Earth Elements for Environmental Catalytic Applications

Rare earth elements (REE) are crucial chemical elements, integral to daily life, with a wide range of technological applications as it is the case of lasers, catalysis or energy storage. They are also used as immunoassays labels or as luminescent probes. The demand for these elements has sharply risen due to their extensive use and numerous and competitive applications. The concentration of their commercialization in specific markets is a challenging factor that should push other economies like the european one to the development of sustainable technologies for the recovery and reutilization of wasted REE. On the other hand zeolites are porous aluminosilicate solids, commonly used for metal recovery from contaminated water and can also serve as supports for heterogeneous catalysis. This study outlines a system for the recovery of REE through multiple adsorption and desorption cycles on matrices of zeolites and explores the potential further use of such supported REE in environmental catalytic reactions. Machine learning (ML) algorithms may be used to select and to predict the behaviour of the REE/zeolite systems. Chemical surface modifications of various zeolites were performed to enhance the recovery of REE from contaminated water. The best surfaces were able to remove over 80% of all the tested REE from the solution, with recoveries above 90% achieved through sorbate leaching. The best-performing zeolites were then employed in continuous flow tests, resulting in over 70% total REE removal and more than 80% total REE recovery for all tested REE. The catalytic potential of the REE/zeolite system was subsequently evaluated in Fenton-type reactions for the degradation of two dyes, tartrazine and indigo carmine, following the addition of iron to the REE/zeolite system. The degradation of tartrazine exceeded 80%, while indigo carmine degradation reached over 95%.

Thamer Adnan Abdullah
University of Technology, Iraq

Biography

Dr. Thamer Adnan Abdullah was born on September 1, 1980, in Baghdad, Iraq. He earned his Bachelor's degree in Chemical Engineering from the University of Technology, Baghdad, in 2004. He works 2 years on Oil Refinery and Chemical Detergents Production in Iraq. Since 2007, he has been a full-time faculty member in the Applied Sciences Department, Applied Chemistry Branch, at the same university. In 2012, he joined the Master's program at GGSIP University, New Delhi, India, focusing on Catalysis (nano-catalyst), and graduated in 2014, during which he published articles and participated in several international conferences. In 2018, he embarked on his Ph.D. journey at the University of Pannonia, Hungary, to further enhance his scientific expertise, obtaining his Ph.D. in Chemical Engineering in 2022. Throughout his academic career, Dr. Thamer has published numerous impactful research articles, attended global conferences, and currently holds a Scopus h-index of 14. His research interests include nano-chemistry for water treatment, environmental chemistry, nanotechnology, and wastewater treatment.

Carboneus and Magnetic Nanomaterials for Oil/Hydrocarbons Removal from Water

The use of different materials in the removal of hydrocarbons and petroleum hydrocarbons is considered one of the diverse water materials with effective oil tools in the field of producing water resulting from spills and hydrocarbons, thanks to its unique properties that include a large surface area and high adsorption capacity. They are carbon nanotubes and magnetic materials, adsorption and various metal particles, and various physical compounds, which contribute to improving the adsorption efficiency through physical activity. The interaction of different materials with hydrocarbons on their surface, based on history such as hydrophobic bonds and van der Waals forces, which increases the interaction between the surface of various materials and polluted organic molecules. The specialized magnetic difference vehicle is unique in this field, as it can be easily separated by magnetic defense after the adsorption strategy using scientific research. This technology is not only effective, but also environmentally good and cost-effective. Studies will show that the use of various materials in oil spills limits their total concentration in water to safe levels, which extends to protecting the marine environment and monitoring water resources. Various materials provide an innovative and sustainable solution to remove hydrocarbons and oil spills from water, making them a promising option to address the various challenges of oil water pollution.

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Day 2

Julien Davin
Saperatec GmbH, Germany

Biography

Julien Davin is a chemistry expert who earned his PhD (Dr. rer. nat.) in organometallic chemistry and homogenous catalysis from RWTH Aachen University in 2014. His career spans a wide range of polymer processing industries, starting with his work in textile technology at the ITA of RWTH Aachen University, where he led a research group focused on bio based polymers. Between 2015 and 2021, Julien worked as a project manager in central R&D at Continental Tires in Hanover. He then moved to Fortum in Finland, where he served as Business Development Manager for the Bio2X program, responsible for marketing organosolv-lignin. In May 2023, Julien joined Saperatec and now leads the sales and marketing of the company's recycled plastics and delamination technology.

Project Agro2Circular and How Delamination Recycling Enables a Closed Loop Recycling of Packaging

Multilayer plastic films are widely used as industrial packaging for the protection of fruit and vegetables. Environmental concerns are growing because more than half of plastic waste created in Europe comes from packaging. In this context, the Agro2Circular project partners have successfully developed the first recycling value chain for post-industrial multilayer films based on a synergistic approach. It combines innovative sorting, delamination, enzymatic depolymerisation, decontamination and mechanical recycling on a pilot scale.

Saperatec is a pioneering company, developing delamination recycling for packaging materials to industrial maturity since 2010 and has launched an industrial recycling plant in Dessau-Roßlau (Germany). As feedstock beverage carton and aluminium barrier flexible packaging materials are intended to be used with a capacity of over 30.000 t/year. Delamination recycling is a hot wash process in which a multilayer material with polymer and metal layers is treated using a specially formulated separation fluid. This fluid enters the boundary layers between the different materials and separates the layers without dissolving or transforming the respective materials. This enables the mechanical recycling and recovery of raw materials from packaging waste, which was formerly condemned to "energetic recycling" and can keep packaging materials in a closed loop.

In the Saperatec plant in Dessau polyolefins are recovered at high quality to produce film-grade LDPE and other recycled plastics for new packaging applications. All chemicals used in the process are listed in European food contact regulation without specific migration limits and are recirculated many times. This makes the delamination recycling an extraordinary environmentally friendly process and gives access to new feedstocks for recycled products.

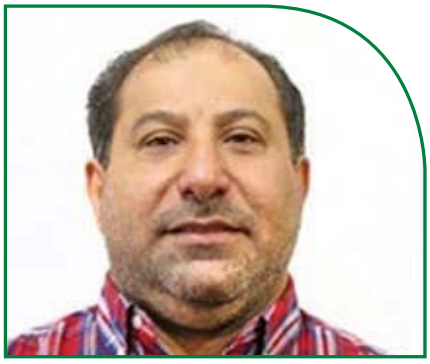
Neus Figueras
ICM-CSIC, Spain

Biography

Neus Figueras is a marine scientist with a Bachelor (Hons) degree in Marine Science and a Master's degree in Marine Biodiversity and Conservation, backed by extensive practical experience. She has worked with the LIFE CUBOMED project to tackle jellyfish proliferation in the Mediterranean and contributed to oceanographic data management and outreach at the ICM-CSIC. Neus has also participated in the VA-DE-RETRO project aboard the Research Vessel Hesperides, studying marine currents. Her work further includes underwater meadow restoration with the University of Salento, marine ecology research in Scotland, and leading a coral restoration initiative in Myanmar.

Beyond Data: The Power of Storytelling to Drive Ocean and Climate Action

Scientific data and figures provide crucial insights into environmental issues, but facts alone often fail to inspire action. Storytelling, however, has the power to transform information into emotional experiences, fostering empathy and driving behavioural change. This presentation explores how narrative-driven communication can be a powerful tool in engaging people in ocean conservation and climate action, making them more willing to respond to calls for change. Marine scientist and author Neus Figueras combines her expertise in marine ecosystems with storytelling to present Lorac—a science fantasy novel that blends adventure with a strong environmental message. The novel serves as an example of how fiction can forge an emotional connection to climate change and ocean threats. By balancing scientific credibility with compelling storytelling, Lorac bridges the gap between knowledge and emotional investment, engaging readers across generations. Its inclusive approach reinforces this impact, showing how environmental and social issues are deeply interconnected. Through strong female characters, indigenous perspectives, and grassroots movements representation, the story reflects the diverse voices and communities at the forefront of climate action. Lorac has inspired readers to take real-world action to protect the ocean and advocate for climate justice—actions they may not have considered before engaging with the story, demonstrating the potential of storytelling to shift attitudes and behaviours. This session will offer key insights into using storytelling as a conservation strategy, highlighting that how we communicate is just as crucial as what we communicate in the fight against climate change and marine degradation.



Firas Al Oqaili
University of Technology, Iraq

Biography

Firas Mohammad Sajet Al-Oqaili earned his Ph.D. in Water Resource Science from Oregon State University in 2020, following his M.S. in Earth Sciences and Environment from Al-Yarmouk University, Jordan (2005), and a B.S. in Agricultural Science from Baghdad University (1993). With extensive experience in teaching and research, he has worked as a lecturer and researcher in soil, water, and environmental sciences in Iraq and the U.S. Dr. Al-Oqaili's research focuses on water resource management, stable water isotopes, and irrigation efficiency in semi- arid regions. He has published multiple impactful articles in international journals and presented at global conferences. Currently, he is affiliated with Oregon State University and actively contributes to advancing water management solutions.

Impact of Drip Emitter Configuration on Irrigation Efficiency and Soil Water Isotope Ratios in a Hazelnut Orchard

Drip irrigation is considered an efficient means of water delivery; however, how irrigation efficiency changes as more emitters are added to a system is unclear, as additional irrigation (I) water may be lost to evaporation (E) before it can be taken up by roots. In this study, non-productive soil evaporation losses (E/I) are estimated based on the hydrogen and oxygen isotope ratios of soil moisture for a hazelnut orchard in the Willamette Valley of the Pacific Northwest. Soil samples from the hazelnut field under single-line and double-line drip irrigation treatments were collected in summer 2018 at multiple depths from different positions in the tree rows. The stable isotope ratio of soil water in these samples was measured using H2O liquid - H2O vapor equilibration laser spectroscopy. Our results show that soil moisture in the double-line treatment was higher than the single-line treatment, however average 2H/1H and 18O/16O soil water isotope ratios of the treatment with single-line drip irrigation were higher than the treatment with double-line drip irrigation. These results suggest that a smaller fraction of applied irrigated water evaporated from the double-line drip irrigation (E/I = 17.3 ± 6%) when compared to the single-line treatment (E/I = 20.9 ± 6.5%). This study demonstrates that increasing the number of drip emitters can lead to an increase in the efficiency of drip irrigation, when efficiency is defined as the fraction of applied water that is used productively by plants.

Hamza Mumtaz
Silesian University of Technology, Poland

Biography

Hamza Mumtaz, a Pakistani national, is currently pursuing a Ph.D. in Poland with a research focus on the innovative recycling of composite waste and municipal solid waste (MSW). His work explores advanced chemical recycling techniques, including oxidative liquefaction. He has published several articles in esteemed journals such as Energy, Renewable Energy, and the Journal of Environmental Management. Throughout his academic journey, Hamza has presented his research at various international conferences and was recognized among the best Ph.D. candidates at Silesian University of Technology. He currently serves as the President of the International PhD Student Council. Passionate about sustainable waste management and the development of circular economy practices, he is now seeking postdoctoral opportunities to further his research and contribute to its industrial applications.

Oxidative Liquefaction as a Sustainable Recycling Approach for Polymeric Waste: Process Optimization and Valorization of Wind Turbine Blades, Personal Protective Equipment, Solar Panels, and Municipal Solid Waste

The accumulation of polymeric waste from wind turbine blades (WTBs), personal protective equipment (PPEs), solar panels (SPs), and municipal solid waste (MSW) presents environmental and economic challenges. Conventional waste management methods, including landfilling, incineration, pyrolysis, and mechanical recycling, have limitations in energy efficiency, emissions, and material recovery. This study explores oxidative liquefaction as an advanced recycling approach to degrade complex polymeric waste into oxygenated chemical compounds (OCCs) for industrial applications. Thermogravimetric Analysis (TGA), Fourier Transform Infrared Spectroscopy (FTIR), and Scanning Electron Microscopy (SEM) were used to characterize waste materials and understand degradation mechanisms under oxidative conditions. A Central Composite Design (CCD) was employed to optimize reaction parameters: temperature (250–350°C), pressure (20–40 bar), oxidant concentration (15–45% H_2O_2), reaction time (30–90 min), and waste-to-liquid ratio (5–25%). ANOVA analysis identified significant process factors.

Results showed PPEs degrade at lower temperatures (250–450°C), while WTBs and SPs require higher thermal input (350–500°C). Optimal conditions (300°C, 30 bar, 30% H_2O_2, 60 min) achieved total polymer degradation (≥95%) and OCC recovery (42 g/kg waste). The recovered OCCs—phenols, aldehydes, carboxylic acids, and esters—are valuable for bio-based resins, solvents, and renewable fuels. Additionally, glass fibers from WTBs and polymer fractions from PPEs and SPs were recovered.

This study demonstrates oxidative liquefaction as a scalable alternative for polymer recycling, promoting circular economy practices. Future research will focus on process scaling, selectivity enhancement, and industrial integration.

Hiren D Raval
Central Salt and Marine Chemicals Research Institute, India

Biography

Dr. Hiren Raval is working as a Principal Scientist with India's national laboratory under Council of Scientific and Industrial Research CSIR-Central Salt and Marine Chemicals Research Institute (CSMCRI). He has published about 46 research papers in reputed journals including Desalination, RSC Advances, Applied surface science, Journal of applied polymer sciences, Desalination and water treatment etc.; majority of them as the corresponding author. He was awarded fellowships of international recognition i.e. International desalination association fellowship and Water advanced research and innovation fellowship both at USA. He has delivered many invited talks, lectures in national/international events and presented papers in many international conferences. He has been a reviewer of prestigious journals. He has led the project as principal investigator aimed at extending the life-cycle of Reverse Osmosis membrane elements, established the pilot plant facility and successfully developed the technology of rejuvenating the fouled/end-of-life Seawater reverse osmosis membrane elements.

End-of-life Reverse Osmosis Membranes: Waste Minimization and Recycling

With increasing demand of pressure-driven membranes, there is a concomitant growth in end-of-life discarded membrane elements to be disposed-off. Reverse Osmosis membrane waste comprises of polymers, different minerals, heavy metals etc. which needs to be dealt with a proper protocol. We developed the technology to extend the life of the Reverse Osmosis membrane elements after their useful life is over. During operations, Reverse Osmosis membrane separate salts, bacteria, viruses, organic molecules etc. from water and the driving force for separation is pressure. Thus, the membrane invariably fouls with long-term operations. Broadly, the fouling can be classified as following: Organic fouling, where the adsorption of organic molecules takes place over the membrane surface depending on the charge on the foulant and membrane surface, Scaling, where the inorganic deposits of Aluminum, Silica, Iron, Calcium, Phosphorous, Sulphate etc. form a scale over the membrane surface primarily due to concentration polarization, Biofouling, where the microbial adhesion and formation of a conditioning film composed of macromolecules, Extracellular polymer substrate, proteins etc. takes place, Colloidal fouling, where the particulate deposition occurs over the membrane surface. Depending on pre-treatment conditions, hydrodynamic conditions inside the membrane element and membrane characteristics, the fouling can be more than one type and with longer operations, the membrane elements have to be discarded and to be replaced with new ones. With growing desalination capacity, there is a significant growth in discarded membrane elements that needs to be disposed off. Thus, recycling and reuse of membrane elements for alternate applications can create significant value from waste and also help environment reduce the greenhouse gas emissions. We have established the facility for end-of-life Reverse osmosis membrane rejuvenation and transformation. The end-of-life Reverse Osmosis membranes may be rejuvenated for the same applications or transformed for alternate applications such as Brackish water Reverse Osmosis, loose Reverse osmosis/nanofiltration, ultrafiltration membrane etc. Moreover, the transformed membranes may find applications in wastewater reuse. We have created the pilot plant facility with Department of science and technology funding.

H Marta
Anthesis Spain, Spain

Biography

Marta Henrich is a graduate in Geology and Environmental Sciences, holding a master's degree in Spatial Planning and Environmental Management. She is certified as an Excel PRO Expert and has strong expertise in GIS software and Power BI. With over four years of experience in environmental consulting, Marta specializes in climate change. Her expertise is demonstrated through her involvement in projects focused on vulnerability mitigation and adaptation to climate change at both local and international levels. She has worked on climate risk assessments, the development of Climate Action and Energy Sustainability Plans (PAESC), Sustainable Development Goals (SDGs) initiatives, and Partial Territorial Plans (PTP).

Importance of Mapping in the Analysis of Climate Change Risk Impacts and the Pathways to Resilience

The beginning of the presentation will start distinguishing between climate change mitigation and adaptation, two fundamental approaches to addressing climate challenges. However, the study has been focused on adaptation, highlighting its crucial role in enhancing resilience at different scales.

To understand and reduce the impacts of climate change, it is necessary to comprehend and study the main climatic risk, which the IPCC defines as a combination of three main components: hazard, exposure, and vulnerability. Vulnerability itself consists of two sub-components—sensitivity, and adaptive capacity. Once the components of climate risk are established and understood, it is important to talk about practical applications. It will explore methodologies for assessing climate-related risks in municipalities, provinces, territories, or specific sectors. Geographic Information Systems (GIS) over recent decades have redefined the role and potential of maps as research tools. Maps are no longer static and stable sources of information; they have evolved into interactive and dynamic tools for analysis and visualization. Particular attention will be given to the role of mapping techniques in visualizing and analyzing the spatial distribution of risk. Mapping enables the identification of the most impacted areas, focusing efforts in the real affected zones, or territories. By integrating spatial analysis into adaptation planning, it is possible to prioritize resilience-building efforts and allocate resources efficiently, in the most critical areas. However, visualizing certain climate change impacts on maps presents challenges. There are difficulties in selecting the most appropriate quantitative methods for different types of risk, determining which indicators contribute meaningfully to geographic information, and assessing when an excess of data adds complexity without real value. Finally, this study presents a selection of case studies that have successfully applied mapping techniques to analyse and address climate-related risks.

Alexis Bellorin
National Fisheries and Aquaculture Research Center (CENIPA), Venezuela

Biography

Dr. Alexis Bellorin holds a Ph.D. in Sciences from São Paulo University, Brazil. He is a researcher at the National Center of Research on Fishery and Aquaculture (CENIPA) under Venezuela's Ministry of Fishery and Aquaculture. His primary research areas include marine biology and seaweed aquaculture. He earned his Doctorate in Sciences from the Central University of Venezuela. He is a researcher at the Scientific Computing Center within the Faculty of Sciences at UCV, specializing in scientific computing and numerical optimization.

Recent Climate Change Forcings on Coastal Upwellings and Artisanal Fishery of *Sardinella Aurita* in Venezuela

The southern Caribbean Sea comprises a unique wind-driven upwelling system, located near the equator (10-12° N) and zonally oriented, encompassing primarily the coasts of the Bolivarian Republic of Venezuela and, to a lesser extent, the Caribbean coasts of Colombia and Trinidad island. The most important small pelagic in this upwelling system is the Spanish sardine, Sardinella aurita, which inhabits the colder and plankton rich waters typical of the upwellings, mainly in the northeast Venezuela. Since 2005 the populations of this ecologically and fishery important forage fish have seriously declined. In this work we assembled several time series of sea surface temperature (SST) and wind field in the southern Caribbean to achieve an oceanological framework to explain these changes. Data were obtained from daily resolution observations-based products (NOAA OISST, NOAA Coral Reef Watch-SST, and NOAA NCEI Blended Seawinds), as well as reanalysis (ECMWF ERA5). Decomposition of additive time series analyses were performed in R. We have found a decreasing trend (-0.006 to -0.01 m.s-1 per year) in surface wind speed since 1987, drastically accentuated after 2022. Since 2000 there is also a clear increase trend on SST (0,012 to 0,27 °C per year), with historical maximum recorded in 2024. Furthermore, the spatial distribution of upwelling plumes with SST <25 °C has been drastically reduced. Altogether, these oceanological forcings fueled by climate change have affected the dynamics of coastal planktonic and small pelagic communities. Since 2022, there is an on-going national research program to *in situ* study the changes in the plankton and *S. aurita* dynamics, with the aim of establishing an adequate framework for its fishery management. This law-protected artisanal fishery is a very valuable source of high-quality, low-cost protein and its decline highlights the severe climate change impacts on Venezuelan coastal communities.

Andrea Bigorra
University of Barcelona, Spain

Biography

Andrea Bigorra is an environmental scientist specializing in climate change adaptation, public advocacy, and the analysis of sustainability and climate action policies at both the European Union and international levels. Currently serving as the Deputy Director of Training at Europa Sostenible—a program within the youth-led organization Equipo Europa. Andrea leads initiatives to equip young people with the knowledge and skills to engage in environmental governance and decision-making. Their work focuses on bridging the gap between scientific research and policy formulation, ensuring that sustainability and climate policies are grounded in solid evidence.

From Science to Action: Youth Advocacy and Research for Effective Climate Change Policies

Scientific research is essential for developing effective climate change policies, yet a significant gap remains between knowledge generation and policy implementation. Bridging this gap is crucial for informed decision-making, but challenges persist in translating scientific insights into actionable policies due to political inertia, communication barriers, and the complexity of integrating interdisciplinary data. A new generation of young climate experts is emerging to address this issue, not only through activism but actively engaging in research, policy analysis, and advocacy. These young professionals play a key role in shaping climate governance by ensuring that scientific evidence informs regulatory frameworks and decision-making processes at multiple levels.

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Dai-Yeun Jeong
Director of Asia Climate Change Education Center, South Korea

Biography

Prof and Dr. Dai-Yeun Jeong is presently the Director of Asia Climate Change Education Center, an emeritus professor at Jeju National University in South Korea, and the Acting Director at Jeju Secretariat of UNESCO World Network of Island and Coastal Biosphere Reserves. 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 professor 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 (UK), the president of Asia-Pacific Sociological Association, a delegate of South Korean Government to UNFCCC and OECD environmental meeting, and a member of Presidential Commission on Sustainable Development 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.

A Framework of Recycling and Waste Management for Establishing a Resource Circulation Society

Natural resources are not currently being circulated as their original circulation system in natural state. Its main reason is caused from the unbalance between the use of natural resources and the treatment of wastes discharged. This unbalance threatens not only the self-regulating system of nature, but also the existence of human life. In this context, this paper aims at developing a framework of recycling and waste management for establishing resource circulation society. For achieving the objective, this paper will be composed of five parts as below.

Part 1: <The concept of resource> will be reviewed from two academic fields – resource economics and environmental sociology. The two have significantly different conceptual definitions of what resource is.

Part 2: <What resource circulation society is> will be introduced in terms of three aspects. They are the concept and aim, key strategies and implications, and empirical cases being promoted to achieve a resource circulation society.

Part 3: <Current status of recourse circulation at a global level> will be critically reviewed from three aspects. One is a review using individual indicator, another one is a review using a synthetic indicator, and the other one is to examine the limitations inherent in the existing strategies being launched for establishing resource circulation.

Part 4: <A desirable direction of recycling and waste management as a resource circulation society> will be established as a framework being composed of four phases. The 1st phase is <identifying the mechanism of resource use and waste discharge>. The 2nd phase is <establishing policies on resource use and waste discharge identified in the 1st phase>. The 3rd phase is <introduction of governance to policy-making process>. The 4th phase is <developing a framework of recycling and waste management for establishing resource circulation society> on the basis of the findings from the above three phases.

Part 5: As a concluding remark, <what capacity should be built in relation to establishing resource circulation society> will be examined. This is because, for example, finance and advanced technologies, and cooperative network, etc. are required for establishing and/or implementing the policies of recycling and waste management for establishing resource circulation society

Roger Achkar
Global Waste Cleaning Network (GWCN), Bury St. Edmunds, UK

Biography

Dr. Roger Achkar, a prominent figure in the field of energy and environmental sustainability, is an engineer and social scientist with academic credentials from esteemed institutions such as Harvard, Leicester, Cranfield, and CentraleSupélec. His interests revolve around social science research's role in understanding and addressing the challenges and impacts of renewable and efficient energy systems, sustainable energy transition, and climate change. Dr. Achkar serves as the Director General of GWCN, a UK-based organization that stands as the world's largest environmental and energy network, boasting over 2,000 member organizations across 187 countries. He also holds the position of General Manager at a company specializing in engine-based and Solar PV power plant contracting, and EV trading.

Objectives and Methods of Battery Recycling: A Comprehensive Overview

The primary objective of battery recycling is to mitigate the environmental impact of used batteries by recovering valuable materials and reducing hazardous waste. This process aims to conserve natural resources, decrease landfill use, and minimize the release of toxic substances into the environment. Additionally, battery recycling supports the circular economy by reintroducing recovered materials into the production cycle, thereby reducing the demand for virgin raw materials and lowering the overall carbon footprint. The methods of battery recycling vary depending on the type of battery being processed. Commonly recycled batteries include lead-acid, nickel-cadmium (Ni-Cd), nickel-metal hydride (Ni-MH), and lithium-ion (Li-ion) batteries. The recycling process typically involves several key steps:

Collection and Sorting: Used batteries are collected from various sources and sorted based on their chemical composition and size. This step is crucial for ensuring the efficiency and safety of subsequent recycling processes.

Discharge and Dismantling: Batteries are safely discharged to prevent any risk of fire or explosion. They are then dismantled to separate the different components, such as casings, electrodes, and electrolytes.

Mechanical Processing: The dismantled components undergo mechanical processing, including crushing and shredding, to reduce their size and facilitate the separation of materials.

Separation and Recovery: Advanced techniques such as hydrometallurgical and pyrometallurgical processes are employed to separate and recover valuable metals like lead, nickel, cobalt, and lithium. These processes involve chemical reactions and high-temperature treatments to extract pure metals from the battery materials.

Purification and Refining: The recovered metals are further purified and refined to meet industry standards for reuse in the production of new batteries or other products.

By implementing these methods, battery recycling not only addresses environmental concerns but also contributes to resource conservation and sustainable development.

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Erika Alves Tavares Marques
Universidade Federal de Pernambuco, Brazil

Biography

Erika Alves Tavares Marques is an environmental expert specializing in water resources and solid waste management, currently a postdoctoral researcher in Civil Engineering at the Federal University of Pernambuco. With a PhD in Development and Environment and a Master's in Environmental Technology, she is actively involved in research with the Environmental Sanitation Group and the INNOVATE Program, focusing on sustainable water management. Marques also collaborates with organizations such as the Brazilian Urban Train Company and the Federation of Industries of Pernambuco, contributing to sustainability initiatives. Additionally, she serves as a reviewer for several international environmental journals.

Management of Waste from Post-Consumer Wind Power Farms in the Brazilian Scenario

Currently the demand for clean energy has increased, due to the consequences of global warming and pollution in general. After facing a water crisis and to meet international commitments, Brazil implemented several policies with the aim of encouraging the search for new energy sources. Among them, wind energy has experienced accelerated growth in the last decade (Figure 1), due to its low cost, low greenhouse gas emissions, its renewable nature, in addition to playing an important role in meeting the country's sustainable development goals. Through incentives, politics and programs, the share of wind energy grew rapidly in the Brazilian electricity matrix (Table 1). However, it is important to highlight that wind energy also generates significant environmental impacts. In Brazil, by 2030, more than 50 wind farms will reach the mark of 20 years of operation, approaching the end of their equipment's useful life and resulting in an increase in the generation of solid waste from this sector. Waste management in the wind sector has attracted increasing attention due to the reaching of the useful life of wind turbines. Given this perspective, this study aims to analyze the strategies adopted by wind farms after the end of their useful life. A narrative review was carried out based on research on scientific articles published in the last 10 years and available on Google Scholar, Scielo and Web of Science. As a result, it was found that managing waste from wind turbines is a complex process, as it involves technological, climatic and economic factors associated with its proper disposal. In view of this scenario, careful planning is essential, in which possible strategies to be adopted are evaluated, such as: extension of the operational useful life of the turbines, partial or total repowering, reuse of post-consumer waste, decommissioning and deactivation of the park.

Maria Pia Di Nanno
National Technological University, Argentina

Biography

Maria Pia Di Nanno is the Teacher at UTN FRCH (Renewable Energys). Member of GEMYS research Group. She is an experienced consultant with a demonstrated history of working in the environmental services industry. She is skilled in Sustainable Development, ISO 14001, Environmental Compliance, Environmental Auditing, Environmental Impact Assessment, and Environmental Management Plans development and control.

Wind Farm Decommissioning Stage in Argentina

The primary objective of the project is to analyze and propose alternatives for the management of wind farms during their decommissioning phase (both partial and total) in the provinces of Chubut and Santa Cruz, Argentina. Additionally, it seeks to assess techno-economic options for managing the waste generated during this phase within Argentina, aiming to minimize environmental impacts and promote the sustainability of the sector. Key achievements to date include the identification of legal requirements and best practices, as well as the establishment of criteria for evaluating decommissioning plans included in environmental impact studies. It was found that the environmental impact studies analyzed exhibit weak or very weak coverage regarding end-of-life scenarios. Furthermore, an analysis of wind turbine materials was conducted, identifying potential national companies involved in managing their components and compiling an inventory of products and activities related to decommissioning. Potential costs associated with these activities were also estimated based on specialized literature.

Particularly critical are the wind turbine blades, which pose significant challenges due to the nature of their materials, which are difficult to recycle. Projections indicate that, starting in 2031, Argentina will generate 46.6 thousand tons of blade waste, based on wind farms installed as of February 2023. To address this challenge, alternatives are being evaluated to repurpose this waste in the production of mortars and concrete, thereby contributing to more sustainable waste management.

Clara Navarro Veiga
DS Smith, United Kingdom

Biography

Clara Navarro Veiga is a Sustainability Manager at DS Smith, working in the Recycling Division. DS Smith is a leading provider of sustainable packaging solutions, paper products and recycling services worldwide. Clara has an MSc in sustainability and has a keen interest and passion for Recycling and the Circular Economy, having done her MSc thesis on this topic. In her work with DS Smith Clara has specialised in paper and card recycling, advocating for changes in the system that will help increase recycling rates, from collection methods of paper for recycling to design of packaging. She was heavily involved in the creation of a UK-specific briefing paper, which highlights how separate collections are essential for better paper and card recycling, and a Europe wide report on key recommendations to get to a 90% paper and cardboard packaging recycling rate in Europe.

Unpacking Paper's Potential

The world is transforming at an unprecedented pace. High performing recycling systems are fundamental to enabling the transition to a more circular economy. In 2020, 33 million tonnes of paper and cardboard packaging waste was generated in the European Union, and this is expected to rise to 39 million tonnes per year by 2030. Over the last 30 years in Europe, we have made major strides to achieve our current fibre-based packaging recycling rate of 82%, and the 4evergreen Alliance have set out a target of 90% across the European Union. By achieving 90%, we could generate up to €1bn more a year for Europe's circular economy, as well as an extra 5 million tonnes of paper recycled. DS Smith has commissioned the report "Wasted Paper: A path to better recycling", shining a light on how this can be achieved. We offer key recommendations on actions that can be taken to unlock the opportunities that reaching a 90% recycling rate will offer to the environment and the economy.

It starts at the source

Improving quality of fibre is the most beneficial change we can make for paper recycling rates. This can be done through source segregation and improving sorting infrastructure.

Recycling requires consistency

With one set of standardised guidelines, municipalities, waste collectors and the public can recycle with ease, while producers of packaging can introduce harmonised labelling and packaging design.

Empower through investment

For Europe to achieve consistently high-quality recycling there needs to be investment in collection and sorting infrastructure.

People need clarity

Equipped with the right knowledge, people will recycle with confidence.

Support with long-lasting recycling legislation

Improving recycling rates requires legislation that lasts, to make investment into paper recycling technologies more accessible.

Portia M Sinnott
MS+ and Springloop Cooperatie UA, United States

Biography

Focused on the transition to a world without waste, Portia M. Sinnott enjoys leading and taking part in cutting-edge environmental projects. An active member of the International Solid Waste Association (ISWA), she is a co-author of the Circular and Low Carbon Cities (CALC) Project "Assessing Circularity in Cities" Handbook and recently presented on US and California Initiatives at the ISWA World Congress in Muscat, Oman. As an US EPA contactor, she and her team developed the tools and content for the popular EPA website "Managing and Transforming Waste Streams: A Tool for Communities". Working with Ruth Abbe & Associates, Portia has designed and directed Waste Characterization Studies for the cities of Mountain View, Palo Alto and Berkeley, as well as conducted Construction and Demolition studies for the City of San Francisco. She also serves as a nonprofit executive for Zero Waste USA and the Northern California Recycling Association.

Measuring Circular Economy in Cities

Many waste managers are familiar with recycling, composting, biological treatment and re-use of some types of materials in their service area, yet it can be challenging to find, identify and engage with proprietors of other kinds of waste prevention cascades. The International Solid Waste Association (ISWA) Circular and Low Carbon Cities (CALC) Project Team investigated a wide variety of initiatives over the last five years and developed a series of insights and tools including a 12-step methodology, all of which can be used to gain a better understanding of circularity in a city, region, or service area.

Dr. Scheinberg and Ms. Sinnott will present on the team's experiences in researching and organizing the initiatives, and preparing the handbook and its associated tools. They will also provide fieldwork examples from around the world - including in Central and Eastern Europe, Africa, the Middle East and the United States, and discuss the role LCAs (Life Cycle Assessments) and CO2 and GHG impacts could and should play in this important work.

Carlos A Nobre
Universidade de Sao Paulo - IEA, Brazil

Biography

Carlos A. Nobre is an Earth System scientist from Brazil. He obtained an Engineering degree in Electronics Engineering from the Aeronautics Institute of Technology (ITA), Brazil, in 1974 and a PhD in Meteorology from the Massachusetts Institute of Technology (MIT), USA, in 1983. He initiated his professional carrier in 1976 at the National Institute for Amazonian Research (INPA), in Manaus, Brazil, as research assistant. He was a researcher with Brazil's National Institute for Space Research (INPE) for over 30 years, where he helped to establish a modern weather and climate forecasting research center (CPTEC-INPE), and was its Director from 1991 through 2003. He created in 2008 INPE's Center for Earth System Science. More recently (2011-2014), he was Ministry of Science and Technology's National Secretary for R&D Policy, where he created in 2011 the National Center for Monitoring and Alerts of Natural Disasters (CEMADEN). He was President of Brazil's Federal Agency for Post-Graduate Education (CAPES) in 2015-2016. He was one of the architects of the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) and LBA's Program Scientist from 1996 to 2002. He was thesis supervisor of over 30 PhD and MSc students and has authored or co-authored over 200 scientific publications. He was chair of International Geosphere-Biosphere Programme (IGBP) Scientific Steering Committee (2005-2011).

Adopting Nature-Based Solutions to Avoid the Tipping Point in the Amazon

The Amazon rainforest plays a crucial role in climate regulation. With extensive vegetation biomass and soil carbon stocks, the Amazon rainforest captures around 0.7 billion tonnes of CO2 yearly and stores around 150-200 Pg C below- and above-soil, making it a significant carbon reservoir. Beyond carbon dioxide removal, Amazonian forests provide diverse climate regulation by recycling rainfall and controlling its seasonality, transporting moisture regionally, and helping to moisten and cool the microclimate. The Amazon is currently undergoing substantial climate changes, marked by an overall warming, increased air dryness and frequency of extreme events like floods, droughts and heat waver. Globally, climate change is impacting the Amazon differentially, with an estimated average temperature increase of 1.0o C over the last three decades. In the southern basin, the dry season has lengthened 4-5 weeks affecting forest resilience. The Amazon has been the tropical region on the Earth with the highest deforestation rate, averaging 1.7 million hectares yearly over the past two decades. The intricate interplay between climate and land use changes, particularly deforestation, degradation and wildfires, historically associated with the expansion of pasture areas, is reinforcing each other, leading to a reduction in the forest's resilience and clear signs of approaching tipping points. All these changes pose profound socioeconomic and ecological consequences for the ~47 million Amazon people, in particular, to the most vulnerable Indigenous Peoples and Local Communities (IPLCs). The standard economic model based on neo-extractivism (livestock farming and soy crops) benefits a few and burdens millions. There is no single solution for such a complex scenario, but Nature-based Solutions are essential components. At its core, this paradigm embraces the appreciation of preserved and restored ecosystems and recognizes the indispensable role of Amazonian communities in safeguarding these vital resources. And the challenge of

implementing at large-scale a innovative socio-bio-economy of standing forests and flowing rivers.

Jose Juan Alonso del Rosario
Univerity of Cadiz, Spain

Biography

Dr. Jose Juan has been a dedicated physics educator since 1992 and earned a Ph.D. in 1998. His research initially focused on tidal forces, leading to the development of a tidal potential. Over time, his work expanded to explore the mechanisms of internal waves in the Strait of Gibraltar. In recent years, he has applied Mathematical Morphology to analyze the evolution of sea surface temperatures, contributing to advancements in Maritime Engineering. Currently, he develops applications within this field at the School of Naval and Ocean Engineering at the University of Cadiz.

Extreme Value Distribution of Sea Level and Statistical Estimation Theory: An Application to the Alboran Sea

When analyzing the extreme values of the sea level to predict the maximum sea level rise at a certain period of return, some extreme values distributions can be valid candidates to be used at the same time. Their parameters are of minimum variance because they come from least square fitting but without ensuring that they can be physically possible. The authors propose the use of the Cramer-Rao Lower Bound, as an estimation theory statistical tool, for the decision of which distribution must be used. An application to the sea level extreme values at the Alboran Sea, with the tidal gauge of Almería, Málaga and Algeciras, is presented to show how such an statistical tools can help to choose those distributions whose parameters are physically possible.

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Sabeela Yaqoob
University of Agriculture, Pakistan

Biography

Sabeela Yaqoob is a humble person with flexible nature, fully disciplined and self. motivated. The most beautiful thing about her is she is always ready to accept good changes in me. She is now in 6th semester of her Ph.D. Agriculture (Agronomy) from University of Agriculture, Faisalabad Pakistan. Throughout her education she has shown good results in her academics. Now it's her keen desire to continue her research to enhancing rice productivity in response to organic fertilizer.

Effects of Maize Stalk and Farmyard Manure Compost Application on Rice Productivity and Soil Properties

Rice *(Oryza sativa L.)* is one of the most important crops that provides food for more than half of the world population. High yielding rice varieties require extensive application of fertilizers for achieving yield for ensuring food security. Globally, crop yields have increased steadily and food security has been improved due to excessive use of fertilizer. Many scientists are threatening that within 50 to 100 years' nutrients will be completely depleted but in plants, nutrients play an important role and deficiency of all significant minerals disrupt the plant life cycle. Higher chemical fertilizers doses are used to fulfil the requirement of nutrients that ensure maximum crop yield which not only contribute to food security, but also cause soil deterioration, greenhouse gas emissions, and water contamination due to low fertilizer use efficiency. So, Inorganic fertilizer is riskier and more expensive than the organic. To overcome that problem, the use of compost can play an effective role in rice growth and development, and also increase fertilizer use efficiency. A wire-house pot experiment was conducted to examine the effects of farmyard manure and maize stalk based compost on morpho-physiological and biochemical attributes of rice seedlings. The treatments were included: four compost application rates; control, 1, 2 and 3 t ha−1 (designated as T0, T1, T2 and T3, respectively), with the objective to enhance nutrients use efficiency and rice productivity by compost application. Results showed that compost application improved crop performance where T2 depicted significantly higher values. Compost applied at the rate of 2t ha−1 increased root fresh weight, shoot fresh weight, root dry weight and shoot dry weight respectively. Also, T2-treated seedlings exhibited significantly higher chlorophyll pigments. However, soil applied compost amendments proved beneficial for improved morpho-physiological, biochemical traits of rice and remarkable potential for improving soil structure, pH and water holding capacity.

Antonio Contreras de Villar
University of Cadiz, Spain

Biography

Antonio Contreras de Villar has a Doctor in Engineering and Architecture, Master in Computational Modeling in Engineering and Technical Engineer of Public Works. Professor at the University of Cádiz in the Department of Industrial Engineering and Civil Engineering, area of Hydraulic Engineering. Member of the Research Group RNM-912 "Coastal Engineering".

Analysis of the Flooding of Coastal Areas Caused by Climate Change. Practical Case on Beaches in The Provinces of Cadiz and Malaga

The rise in sea level is one of the consequences of climate change. This rise in sea level brings with it coastal flooding and consequent erosion, making it a threat to coastal systems. Numerous publications have been written addressing the calculation at different scales (global, regional, and local) of sea level rise in natural or anthropogenic environments. The current trend of sea level rise due to climate change (IPCC, 2022; Jigena et al., 2021) shows extensive and potentially catastrophic risks for ecosystems, human populations, built infrastructures, and the economies of coastal areas (Aguilera-Vidal et al., 2022).

Exploring the current and future risks of coastal hazards and comparing the cost-effectiveness of nature-based solutions versus artificial or technology-based ones, in order to reduce risks, prevent damage, and ultimately aid in adaptation decision-making, is the objective of this study. Based on data from various specialized and validated climate change reports (IPCC, 2022), the rise in sea level and wave height have been assessed for different medium- and long-term scenarios. Cross-sectional profiles of different beaches have been taken to subsequently perform simulations with all the variables to determine the coastal flood area. The chosen study areas have been the provinces of Cádiz and Málaga, representative of the other Andalusian provinces and with different characteristics (tide, coastal occupation, ...). From these provinces, several beaches have been selected. The study allows for the development of a comprehensive methodology that enables the easy extrapolation of the models to the rest of the Andalusian coastline. Work carried out thanks to the R&D&I call funded by the European Union Next Generation EU.

Ivana Sola
University of Zagreb, Croatia

Biography

Dr. Ivana Sola, Assoc. Prof. works in Laboratory for Phytochemistry at the Department of Biology, Faculty of Science, University of Zagreb. Her main scientific interest is plant specialized metabolism plasticity under different environmental conditions. So far, she has led, or was a collaborator, on more than 10 international and national projects. She is a coauthor of 44 scientific papers, 1 manual, and participated in more than 80 international congresses. She teaches Fundamentals of Phytochemistry, Plant Anatomy, Plant Bioactive Substances, Plants in Phytotherapy, Molecular Biology of Plants, and leads the Laboratory Professional Practice.

Phytochemical Resilience and Bioactivity of Broccoli in Response to Temperature Stress: Susceptible vs. Resistant Markers

Among the most evident factors of climate change are variations in temperature, which can have a major impact on the physiological and biochemical processes in plants. Plants may adjust their metabolism to such an extent that it has a significant impact on their nutritional potential and the biological activity of their extracts. In scope of this work, we aimed to determine the level of susceptibility/resistance of broccoli *(Brassica oleracea* L. convar. *botrytis* (L.) Alef. var. cymosa Duch.) phytochemical parameters and its extracts' bioactivity in response to low (LT) and high (HT) growing temperatures and single out sensitive ones as potential markers of LT/HT stress. The results revealed that two of the most significant changes were under LT: soluble sugars increased by 137%, whereas total anthocyanins decreased by 81%. The third most significant change was under the HT - an IAA increase by 78%. Based on the collected data, we concluded that both HT and LT significantly changed the broccoli microgreens at the level of the parameters analyzed, by 82% and 81%, respectively. Among the altered parameters, HT increased 44% of them, while LT increased 55%. The parameters that were significantly changed by HT, but not LT, were the total proanthocyanidins, kaempferol, sinapic acid, the hormone IAA, and the antioxidant capacity measured by the ABTS method. On the other hand, the parameters significantly affected by LT, but not HT, were the total proteins and tannins, the antioxidant capacity measured by the DPPH and FRAP methods, and the potential to inhibit the enzyme lipase. We assumed that, among these parameters responsive to one but not to the other temperature stress type, we could search for the mediators that are crucial for plants' adjustment to HT/LT stress.

Ivana Sola
University of Zagreb, Croatia

Biography

Dr. Ivana Sola, Assoc. Prof. works in Laboratory for Phytochemistry at the Department of Biology, Faculty of Science, University of Zagreb. Her main scientific interest is plant specialized metabolism plasticity under different environmental conditions. So far, she has led, or was a collaborator, on more than 10 international and national projects. She is a coauthor of 44 scientific papers, 1 manual, and participated in more than 80 international congresses. She teaches Fundamentals of Phytochemistry, Plant Anatomy, Plant Bioactive Substances, Plants in Phytotherapy, Molecular Biology of Plants, and leads the Laboratory Professional Practice.

Modifications in the phytochemical composition of broccoli in response to different growing temperatures

Climate change is altering temperature patterns worldwide, impacting various aspects of ecosystems, including plant physiology and chemistry. Plants are known to possess mechanisms to adapt to changing environmental conditions, including shifts in temperature. One way they adapt is by adjusting their chemical content, which can affect their growth, development, and interactions with other organisms. Understanding how plants respond chemically to changing temperature patterns is crucial for predicting how ecosystems will fare in the face of climate change. In scope of this work, we applied spectrophotometric and high-performance liquid chromatography analyses in order to study the effect of low (LT) and high temperature (HT) on the phytochemical content of broccoli microgreens. Low temperature increased total phenolics and tannins. Total glucosinolates in broccoli microgreens were increased by LT, but decreased by HT. Soluble sugars, known osmoprotectants, were increased by both types of stress, considerably more by HT than LT, suggesting that HT causes a more intense osmotic imbalance. Chlorophyll content was detrimentally affected by both LT and HT, with HT being more impactful. HT increased the hormone indole-3-acetic acid, possibly indicating a role in broccoli defense mechanisms. There was a trade-off scheme observed between ferulic and sinapic acid, with HT increasing ferulic acid and LT increasing sinapic acid. Our study provides valuable insights into how temperature influences the phytochemical composition of broccoli microgreens, which could have implications for dietary recommendations in the context of climate change. It can also inform agricultural practices, such as crop selection and breeding for improved resilience to temperature fluctuations. Overall, studying the chemical adaptations of plants to climate change provides valuable insights into the resilience and sustainability of ecosystems in a changing world. This study was conducted in scope of the project IP-2020-02-7585 "Indirect Effect of Global Warming on Mammals Physiological Parameters via High Temperature-Stressed Plant Diet (TEMPHYS)".

Vasileiadou Agapi
University of Thessaly, Greece

Biography

Dr. Agapi Vasileiadou is an Assistant Professor focused on "Energy Production, Conversion, and Storage Systems", at the Department of Energy Systems, University of Thessaly, Greece. She holds 2 Bachelor of Science: B.Sc. in Mechanical Engineering and B.Sc. in Geotechnology and Environmental Engineering, 2 Master of Science: M.Sc. in Quality Assurance and M.Sc. in Mechatronics, and a Doctor of Philosophy Ph.D. in Engineering (receiving unanimous "Excellent") at the Department of Environmental Engineering, at the Polytechnic School, Democritus University of Thrace, Greece. In addition, she has completed the Annual Pedagogical and Teaching Proficiency training program at the University school of Pedagogical and Technological Education ASPETE.

Sustainable Energy Production from Brewery Solid Wastes

Beer is one of the most popular drinks worldwide. Beer production creates a large amount of solid waste, brewers' spent grain, that represents about 85% of the beer industry wastes. About 70% of these wastes are used as animal feed, and about 20% is landfilled untreated. Nowadays, these practices are not conformed to EU directives, as they are not suitable for animal feed (due to microbial activity), and their untreated disposal can cause several environmental problems (due to high moisture and high fermentable sugar content). One ton of landfill brewers' spent grain releases more than 500 kg CO2eq. Therefore, there is a need for sustainable alternative utilization of these wastes. The scope of this work is to examine the thermochemical properties of these agro-industrial wastes via several thermochemical analyses (such as energy content analysis, ultimate and proximate analyses, elemental ash analysis, etc.) in order to examine their utilization as feedstock for energy purposes. The results showed high energy yield (more than 19 MJ/kg), extremely low ash content (less than 5%), and high reactivity (Rmax 5.46%/min, at Tmax 307). The elemental analysis of the secondary wastes (ash) showed that the main component is the CaO oxide (about 60%), ash 'type C'. This indicates that brewers' spent grain can also be used as an additive or in blends with other fuels (cofiring) with a positive synergistic effect (physical desulfurization and physical Cl capture in ash due to Ca contained in the fuel ash). The results of this study could help with sustainable bioenergy production using biomass industrial solid wastes, better waste management in beer industries, and generally the implementation of the circular economy practices.

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