EU CONEXUS

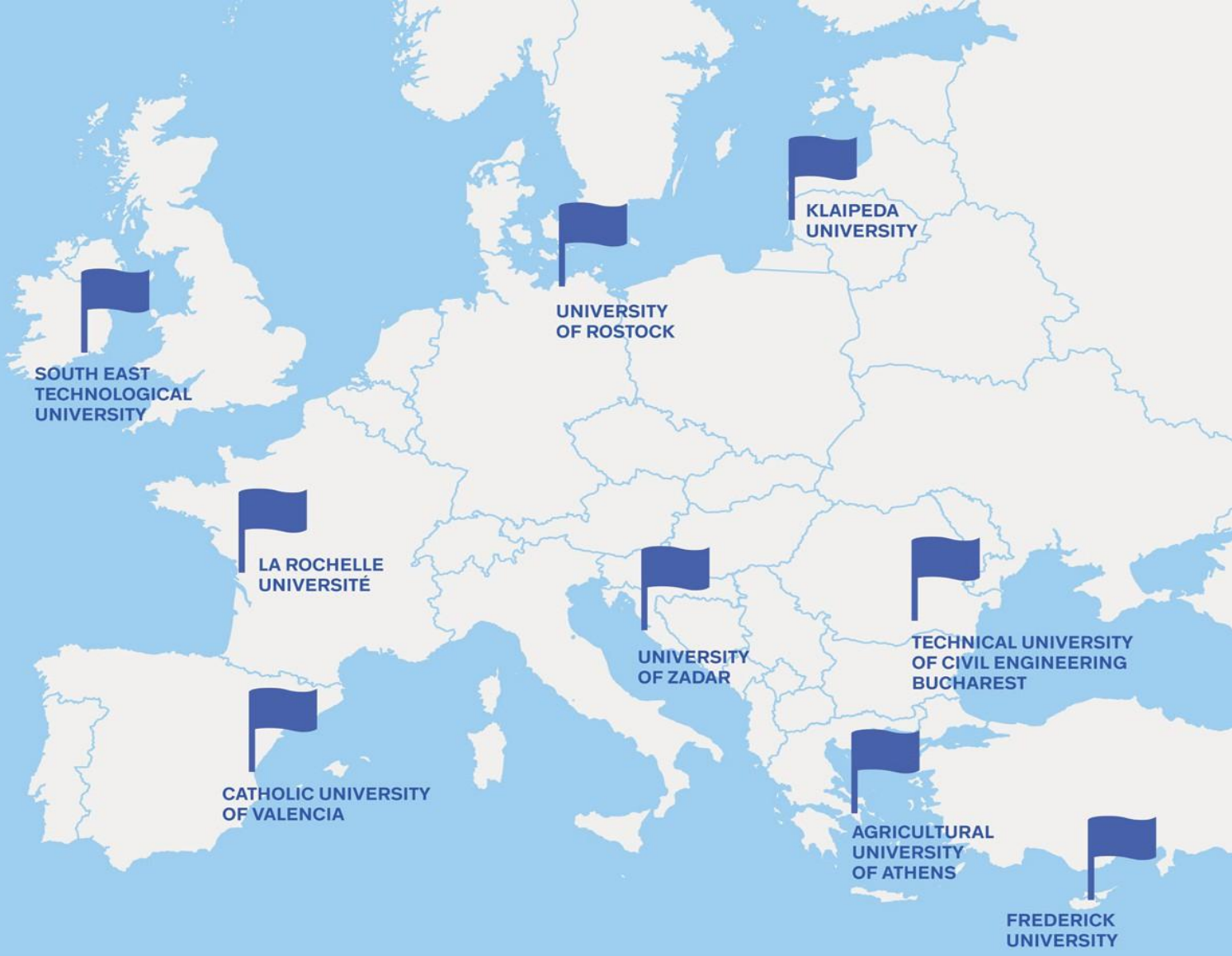
Co-funded by the European Union

EU-CONEXUS Conference 2026

Challenges, Innovative Solutions and Collaborative Actions for Sustainable Urban Coastal Development

10-12 June 2026, Athens, GR

BOOK OF ABSTRACTS



European University for Smart Urban Coastal Sustainability

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About the Conference

The **EU-CONEXUS Conference 2026: *Challenges, Innovative Solutions and Collaborative Actions for Sustainable Urban Coastal Development*** addresses key issues affecting urban and semi-urban coastal regions, including coastal, riverine, and marine environments.

Its thematic scope encompasses smart coastal infrastructure for disaster mitigation, waste management, disease management, soil conservation and remediation, food safety and quality, the protection of oceans and water resources, and climate change adaptation and mitigation in coastal environments.

The Conference aims to examine the societal implications of these issues, showcase scientific and technological advances, present collaborative initiatives, and explore the ways in which research-informed solutions can support sustainable policy and practice.

The scientific programme is organised around three thematic sessions:

- **Session 1**: *Soil Preservation/Restoration, Healthy Food Production, Disease Management: Innovation and Socio-Cultural Governance*
- **Session 2**: *Protection of Oceans, Seas & Waters and Sustainable Coastal Waste Management through Socio-Ecological Transitions*
- **Session 3**: *Infrastructure & Nature-Based Solutions for Disaster Risk Reduction and Climate Change Adaptation with Local Knowledge & Cultural Practices*

Through keynote lectures, round-table discussions, oral presentations, and poster sessions, the Conference fosters interdisciplinary dialogue, strengthens international collaboration, and promotes sustainable solutions for resilient coastal com-munities and ecosystems.

Scientific Committee

Prof. Emmanouil Flemetakis,
Agricultural University of Athens

Prof. Zvjezdan Penezić,
University of Zadar

Prof. Ingrid Arnaudin,
La Rochelle Université

Prof. Artūras Razinkovas-Baziukas,
Klaipeda University

Prof. Juan Sapena,
Catholic University of Valencia

Prof. Alan Davy,
South East Technological University

Prof. Florin Baltaretu,
Technical University of Civil Engineering of Bucharest

Prof. Bettina Eichler-Löbermann,
University of Rostock

Prof. Ilinca Năstase,
Technical University of Civil Engineering of Bucharest

Prof. Michalis Menicou,
Frederick University

Organising Committee

Prof. Emmanouil Flemetakis,
Agricultural University of Athens

Vera Charitou,
EU-CONEXUS Institutional Coordinator, Agricultural University of Athens

Dr. Aikaterini Kalliampakou,
EU-CONEXUS Institutional Research Manager, Agricultural University of Athens

Foteini Paradeisi,
EU-CONEXUS Institutional Communication Manager, Agricultural University of Athens

Dr. Evanthia Chatzoglou,
EU-CONEXUS "Research Back into Education" Coordinator, Agricultural University of Athens

Mr. Christos Vatistas,
PhD Candidate, Department of Natural Resources Development and Agricultural Engineering, Agricultural University of Athens

Prof. Sophie Mavrikou,
Agricultural University of Athens

Prof. Dimitrios Skliros,
Agricultural University of Athens

Prof. Dimitrios P. Vlachakis,
Agricultural University of Athens

Dr. Eleni Papakonstantinou,
Research Associate, Agricultural University of Athens

Ms. Christina Zantioti,
EU-CONEXUS Student Engagement Officer, Agricultural University of Athens

Keynote Speakers

Session 1

Dr. Philipp Wree,

Head of Division Bioeconomy – Smart Farming, Fraunhofer Institute for Computer Graphics Research

KEYNOTE LECTURE: ***Smart Farming and Applied Research in Visual Computing and AI***

Dr. Philipp Wree is responsible for the area of bioeconomy at the Fraunhofer Institute for Computer Graphics Research IGD. This area enables visual computing and AI technologies for effective and sustainable production in crops, peatlands, and livestock. Philipp Wree holds a B.Sc. in Forestry and Forest Ecology from the University of Göttingen and an M.Sc. in Agricultural and Re-source Economics from Humboldt University of Berlin. In 2017, he earned his Ph.D. in Agricultural Sciences from the Technical University of Munich. He gained industry experience at Yara (a global leader in plant nutrition) as head of the laboratory and field and greenhouse trial department and supporting the global digitalization strategy. Before joining the Fraunhofer in Rostock in 2022, Philipp Wree worked as a Senior Manager at EY in Business Consulting, focusing on the agriculture and food sectors.

Prof. Lukáš Kalous,

Department of Zoology and Fisheries, Czech University of Life Sciences Prague

KEYNOTE LECTURE: ***Fish, People and Freshwater Ecosystems: Aquaculture, Biological Invasions and Sustainable Management***

Dr. Lukáš Kalous is Professor of Applied Zoology at the Czech University of Life Sciences Prague and Vice-Dean for Quality Assurance at the Faculty of Agrobiology, Food and Natural Resources. His research focuses on ichthyology, aquaculture, freshwater biodiversity, invasive species, and sustainable fisheries management, with particular emphasis on the interactions between food production, biodiversity conservation, and human impacts on aquatic ecosystems. He combines ecological and molecular genetic approaches to support sustainable aquaculture, responsible management of aquatic resources, and science-based solutions for environmental and food-system challenges. He has authored more than 100 scientific publications indexed in Web of Science and participates in national and international projects addressing bioeconomy, aquatic biodiversity, food sustainability, and environmental governance.

Prof. Theofania Tsironi,

Laboratory of Food Process Engineering, Department of Food Science and Human Nutrition, Agricultural University of Athens

KEYNOTE LECTURE: ***Safe and Sustainable by Design: Translating food science innovation into food industry practice***

Dr. Theofania Tsironi (Chemical Engineer, MPH, PhD) is Associate Professor at the Laboratory of Food Process Engineering of the Department of Food Science and Human Nutrition at the Agricultural University of Athens. Her research focuses on food engineering and food packaging, with emphasis on spoilage kinetics, the development of mathematical models for shelf life prediction and the investigation of the effect of processing, storage and packaging conditions on food quality and safety. Particular emphasis is placed on the development of innovative packaging materials (biodegradable, edible and active systems), the application of advanced non-thermal processing technologies, such as cold plasma, for surface modification of polymers and enhancement of the functionality of active packaging, as well as on the implementation of smart systems for cold chain monitoring. She has participated in more than 30 research projects funded by the European Union, national agencies, and industry and has served as coordinator and principal investigator in projects such as AQUAPACK, Pack4Fish and ICHTHYS. Her publication record includes 87 papers in peer-reviewed international scientific journals, 10 book chapters and more than 170 presentations at international and national conferences (h-index: 29, Scopus). She has received several awards and distinctions for her scientific work, including distinctions at international conferences (George F. Stewart IFT International Research Paper Competition, IFT Food Packaging Division Student Competition, and IFT Nonthermal Processing Division Student Competition), as well as excellence awards and fellowships. She serves as Associate Managing Editor of the journal Packaging Technology and Science (Wiley) and Associate Editor-in-Chief of the journal Aquaculture and Fisheries (Elsevier) and is an active member of international scientific organizations and committees. Since 2018, she has been co-chair of the Working Group “Regulatory Aspects of Reducing Postharvest Losses” of the Global Harmonization Initiative (GHI).

Keynote Speakers

Session 2

Dr. Cristina Huertas-Olivares,
European Research Infrastructure Consortium (LifeWatch ERIC)

KEYNOTE LECTURE: ***Smart Farming and Applied Research in Visual Computing and AI***

Dr. Cristina Huertas-Olivares is a Senior Scientific Officer at LifeWatch ERIC, the European Research Infrastructure for Biodiversity and Ecosystem Research (Statutory Seat Office, Seville, Spain), where she coordinates international projects and supports the Executive Board. She holds a PhD in Chemical Engineering and Environmental Sciences, an Executive MBA, a Master's in Water Engineering, and is currently a student of Behavioural Psychology. With a multidisciplinary, intersectoral and boundary-spanning experience, her work has covered areas of marine and coastal biodiversity, ecosystem services, ocean energy, environmental impact assessment and energy transition, with particular attention to how science-policy interfaces and open science infrastructures can bridge biodiversity data and decision-making. Cristina has over 20 years of international experience across research, industry and academia, having previously led R&D teams at Wave Energy Centre (Lisbon), Aben-goa and Ayesa (Spain). She has participated in more than 40 competitive research projects and continues to lead projects in the field of marine biodiversity and ecosystem research. She is co-founder of INORE (International Network of Offshore Renewable Energy) and one of three European experts selected by the European Commission to support the definition of the EU SET-Plan for Ocean Energy. Cristina actively participates in international scientific networks and conferences, most recently as Co-Chair of a Theme Session at the ICES Annual Science Conference 2025. She also serves as an Expert Evaluator of R&D projects for the European Commission and has taught in more than eleven university programmes in three languages.

Dr. George Triantafyllou,
Research Director, Institute of Oceanography, Hellenic Centre for Marine Research (HCMR)

KEYNOTE LECTURE: ***Ecosystem Modeling: From Phys 2 Fish***

Dr George Triantafyllou has a PhD in Oceanography, an MSc in Oceanography and a BSc in Mathematics. He is an elected Research Director of HCMR/Institute of Oceanography with 30 years of experience in marine science with particular em-phasis on marine ecological modeling. He has post-doc experience from UWM, Dept. of Geosciences, teaching Dynamic Meteorology, and conducting research in Geophysical Fluid Dynamics and Non-linear Dynamics. Since 1995 he has worked as a Researcher at IMBC, now HCMR, conducting research in Marine Dynamics and Ecosystem Modeling, giving lectures on Dynamics and Modeling of Marine Ecosystems at the University of Crete, and been actively involved as coordinator, project leader and researcher in numerous European and national research projects. His research interests include data assimilation and operational marine ecosystems modeling, marine ecosystem management, nonlinear prediction, climate dynamics, development and application of individual based models (IBM). He has 82 publications in peer-reviewed journals, books and scientific series, and more than 150 conference presentations.

Prof. Stefan Mihai Petrea,
Vice-Dean, Faculty of Food Science and Engineering, "Dunărea de Jos" University of Galați

KEYNOTE LECTURE: ***Advancing Blue Economy Sustainability through Participatory Ecosystem Protection - Restoration and Smart Decision-Support Tools***

PhD. eng. ec. Ștefan PETREA has been the vice-dean of the Food Science and Engineering Faculty from "Dunărea de Jos" University of Galati, since the year 2024. He has a multidisciplinary background, having 3 bachelor's and 2 master's degrees, in economic and engineering fields, getting his PhD degree in Industrial Engineering, in 2014. Throughout his professional career, he has successfully completed a number of 6 international research internships and conducted research as an inter-national expert, in collaboration with the French Development Research Institute, in the SE Asia area. He has published over 150 scientific papers in the field of Bioeconomy, over 90 of which are indexed in WoS, is the author of 4 patent applications and is co-author of 4 books/book chapters. He coordinated the research activities, as project manager, within 6 international projects and 5 national projects, accumulating a value of over 3,000,000 euros. He held the position of researcher/expert in over 15 national and international projects.

Keynote Speakers

Session 3

Prof. Viorel Popa,

Vice Rector, Department of Reinforced Concrete Constructions, Technical University of Civil Engineering Bucharest (UTCB)

KEYNOTE LECTURE: ***Seismic Resilience of Existing Buildings in Romania: Technical Regulations, Retrofitting Challenges and Environmental Trade-Offs***

Dr. Viorel Popa is Associate Professor at the Reinforced Concrete Department in UTCB. His activity is mainly focused on the mitigation of the social and economic impact of earthquakes by reducing the vulnerability of buildings. He held the position of Dean of the Faculty of Civil Engineering in UTCB from 2016 to 2020. From 2002 to 2010, he held research and management positions at the National Center for Seismic Risk Reduction, the implementing agency of the Romanian–Japanese technical cooperation project for seismic risk reduction, where he coordinated the establishment of the Structural Testing Laboratory and structural testing programs.

He participated in the elaboration of the Romanian Seismic Design Code P100 and coordinated the elaboration of the National Annex of the European Standard EN1998-1, the new edition of the Romanian Seismic Design Code, and the Romanian Seismic Assessment Code. Viorel Popa is President of the Romanian Commission for the Certification of Structural Engineers and a member of national committees for seismic and structural engineering.

He has participated in the elaboration of technical projects for several representative buildings in Bucharest, including Globalworth Campus, Oregon Park, Globalworth Tower and Bucharest National Stadium. His research activity is focused mainly on the assessment and reduction of the seismic vulnerability of buildings. The results of his research activity have been published in various journals and conferences worldwide.

Prof. Michael Triantafyllou,

Director, MIT Sea Grant Program; Henry L. and Grace Doherty Pro-fessor in Ocean Science and Engineering, Department of Mechanical Engineering, Massachusetts Institute of Technology (MIT)

KEYNOTE LECTURE: ***Architected Reefs: Offer Exceptional Coastal Storm Protection at Much Lower Cost***

Dr. Michael Triantafyllou is the Henry L. and Grace Doherty Professor in Ocean Science and Engineering at the Massachusetts Institute of Technology. He is the Director of the MIT Sea Grant Program and served as the Director of the Center for Ocean Engineering in the Department of Mechanical Engineering from 2005-2017.

He teaches and has published over 350 journal articles and refereed conference papers in the areas of biomimetics, dynamics and control of marine systems, cable mechanics, and experimental fluid mechanics. He pioneered the development of science-driven biomimetic robots to study the basic mechanisms of flow control that lead to the outstanding agility of fish and cetaceans. The RoboTuna original design is at the Science Museum in London, while a second version of the robot shown at left, is on exhibit at the MIT Museum. He is currently studying the physics of flow sensing in fish and marine mammals to achieve super-maneuverability in ocean vehicles through flow feedback control.

He has served as Associate Department Head in the Department of Mechanical Engineering (2008-2010) and has been a Visiting Scientist at the Woods Hole Oceanographic Institution since 1991. He is serving on the American Bureau of Shipping's Marine Technical Committee (2015-). He is Chairman of the Board of the National Technical University of Athens (2013-2017).

Lecturer Viktorija Jakubauskytė- Andriulienė,
Communication Lecturer, LCC International University (Klaipėda) and Vilnius Gediminas Technical University (Vilnius)

KEYNOTE LECTURE: ***Architected Reefs: Offer Exceptional Coastal Storm Protection at Much Lower Cost***

Viktorija Jakubauskytė-Andriulienė is a PhD candidate in Communication and Information at Vilnius Gediminas Technical University and a lecturer in Communication field at LCC International University (Klaipėda) and Vilnius Gediminas technical University (Vilnius). Her research focuses on sustainability communication, organisational culture and employee creativity, with particular attention to how communication shapes collective / organizational sustainability mindsets. Viktorija has extensive academic and 20+ years professional experience in public relations, strategic communication, and regional development, and actively participates in international research networks and sustainability-focused initiatives. Viktorija also serves as EU-CONEXUS External Advisory Board member and EU Climate Pact Ambassador.

Guest Speakers from European University Alliances

Prof. Spyridon Kintzios,
Agricultural University of Athens
EU-CONEXUS

Prof. Sotirios Karellas,
National Technical University of Athens
EULiST

Prof. Konstantinos Kounetas,
University of Patras
EUNICoast

Prof. Konstantinos-Alketas Oungrinis,
Technical University of Crete
EURECA-PRO

Prof Nikolaos Samaras,
University of Thessaly
INVEST

Prof. Maria Psillaki,
University of Piraeus
EUonAIR

Round Table

Round Table 1

The role of science and society in the "One Health" approach. How easy are the solutions proposed by science to be implemented in practice and adopted by society and government?

Moderator: **Prof Sofia Mavrikou,** *Agricultural University of Athens*

Round Table Panel

Prof. Theofania Tsironi,
Agricultural University of Athens

Dr. Philipp Wree,
Fraunhofer Institute for Computer Graphics Research

Prof. Lukáš Kalous,
Czech University of Life Sciences Prague

Prof. Nazgol Emrani,
University of Rostock

Prof. Zvjezdan Penezić,
University of Zadar

Prof. Dimitrios P. Vlachakis,
Agricultural University of Athens

PhD Student Mareeha Rafiq,
Agricultural University of Athens

Round Table

Round Table 2

How can we reduce the impact of our civilization on the environment? How easy are the solutions proposed by science to be implemented in practice and adopted by society and government?

Moderator: **Dr Evanthia Chatzoglou,** *Agricultural University of Athens*

Round Table Panel

Prof. Stefan Mihai Petrea,
"Dunărea de Jos" University of Galati

Dr. Cristina Huertas-Olivares,
European Research Infrastructure Consortium LifeWatch ERIC

Prof. Emmanouil Malandrakis,
Agricultural University of Athens

Prof. Marie-Sophie Bondon,
La Rochelle Université

Prof. Charalambos Chasos,
Frederick University

Prof. Ivan Župan,
University of Zadar

PhD Student Edita Lenkauskaite,
Klaipeda University

Round Table

Round Table 3

Are sustainable coastal cities a utopia? How can we improve existing infrastruc-ture and redesign our coastal cities to make them sustainable? How easy are the solutions proposed by science to be implemented in practice and adopted by soci-ety and government?

Moderator: **PhD Student Christos Vatistas,** *Agricultural University of Athens*

Round Table Panel

Lecturer Viktorija Jakubauskytė-Andriulienė,
LCC International University (Klaipeda) and Vilnius Gediminas technical University (Vilnius)

Prof. Viorel Popa,
Technical University of Civil Engineering of Bucharest

Prof. Remigijus Dailidė,
Klaipeda University

Lecturer Irene Angastinioti,
Frederick University

Prof. Catalin Ioan Teodosiu,
Technical University of Civil Engineering of Bucharest

Dr. Yvonne Kavanagh,
South East Technological University

Ms. Katerina Papadouli,
Agricultural University of Athens

PhD Student Pieris Panagi,
Frederick University & University of Rostock

EU-CONEXUS ENABLES Hackathon: Gamifying Agricultural & Biotech Education

As a parallel activity of the Conference, the EU-CONEXUS ENABLES Hackathon challenged teams of undergraduate, postgraduate and doctoral students to design and develop a digital tool (game, app, simulation, or interactive platform) that explains a concept related to agriculture or biotechnology in an engaging and educational way. The challenge focused on the development of learning experiences tailored to 15-year-old students.

Hackathon Lead

Dr. Aikaterini Koletti, *Agricultural University of Athens*

Hackathon Mentors

Prof. Helen Hughes,
South East Technological University

Lecturer Rachel O' Dowd
South East Technological University

Prof. Konstantinos Demestichas,
Agricultural University of Athens

Hackathon Jury

Prof. Sofia Mavrikou,
Agricultural University of Athens

Prof. Dimitrios P. Vlachakis,
Agricultural University of Athens

Prof. Helen Hughes,
South East Technological University

Prize Awarding

Prof. Ilinca Năstase,
Technical University of Civil Engineering of Bucharest

Lecturer Rachel O´ Dowd,
South East Technological University

Ms. Sabine Brueser,
University of Rostock

Programme

Wednesday

June 10, 2026

Agricultural University of Athens,
75 Iera Odos, Athens 11855
Main Venue: Conference Center

08:30 – 09:00 Registration

09:00 – 09:15 Welcome

- **Prof Emmanouil Flemetakis,** Vice Rector for Academic and Administrative Affairs, Lifelong Learning and Outreach, Agricultural University of Athens
- **Ms Vera Charitou,** EU-CONEXUS Institutional Coordinator, Agricultural University of Athens
- **Dr Katerina I. Kalliampakou,** EU-CONEXUS Institutional Research Manager, Agricultural University of Athens

09:15 – 09:30 Crossing Boundaries, Creating Knowledge: The Interdisciplinary Research Institutes of AUA

Dr Vasiliki Tsagou, Head of the Pa.K.E.K. Support Office

SESSION 1:

Soil Preservation/Restoration, Healthy Food Production, Disease Management: Innovation and Socio-Cultural Governance

Chair: **Prof Maria Papasavva** *(Frederick University)* & **Prof Ana Pérez Villalba** *(Catholic University of Valencia)*

09:30 – 10:00 Keynote Lecture

Smart Farming and Applied Research in Visual Computing and AI

Dr Philipp Wree, Head of Division Bioeconomy – Smart Farming, Fraunhofer Institute for Computer Graphics Research

10:00 – 11:00 Short Talk 1

Multi-Scale Soil Texture Prediction Using Multi-Temporal Sentinel-1 and Sentinel-2 Data and Machine Learning

Dr Swen Meyer, University of Rostock

Short Talk 2

From Molecules to Coastlines: An R&D Pipeline on Biologicals for Sustainable Urban-Coastal Agriculture

Prof Konstantinos A. Aliferis, Agricultural University of Athens

Short Talk 3

Quinoa as a Model for Genomics-Driven Breeding of Climate-Resilient and Healthy Crops

Prof Nazgol Emrani, University of Rostock

Wednesday

June 10, 2026

Agricultural University of Athens,
75 Iera Odos, Athens 11855
Main Venue: Conference Center

Short Talk 4

Blue Biomass for Sustainable Packaging: Biobased Films from Microalgal Whole Biomass and Exopolysaccharides

Christina Anna Stafyli, PhD Student at Agricultural University of Athens

11:00 – 11:30 **COFFEE BREAK**

11:30 – 12:00 Short Talk 5

From Farm to Fork: A Situation Analysis of the Environmental and Health Co-Benefits of Reducing Food Waste and Shifting Diets

Prof Jurgita Andruškienė, Klaipeda University

Short Talk 6

Healthy Food Production on Croatian Islands – Potentials, Threats and Challenges

Prof Anica Čuka, University of Zadar

12:00 – 12:30 Keynote Lecture

Fish, People and Freshwater Ecosystems: Aquaculture, Biological Invasions and Sustainable Management

Prof Lukáš Kalous, Full Professor at the Department of Zoology and Fisheries, Czech University of Life Sciences Prague

12:30 – 13:00 Free Discussion

13:00 – 14:30 **LUNCH BREAK**

EU-CONEXUS Opportunities for Researchers (achievements and prospects)

Chair: **Dr Eleni Papakonstantinou** *(Agricultural University of Athens)*

14:30 – 14:45 Collaborative Platform

Prof Dimitrios P. Vlachakis & Dr Eleni Papakonstantinou, Agricultural University of Athens

14:45 – 15:00 AQUAPACK: Sustainable Packaging Solutions for Food and Cosmetics Based on Aquatic Biomass and Sidestreams

Prof Theofania Tsironi, Agricultural University of Athens

Wednesday

June 10, 2026

Agricultural University of Athens,
75 Iera Odos, Athens 11855
Main Venue: Conference Center

Research Area Structures in European University Alliances and Stakeholder Collaboration on Coastal Projects – Collaboration Opportunities

Chair: **Ms Vera Charitou** *(Agricultural University of Athens)*

15:00 – 15:15 **Welcome Address on behalf of EU-CONEXUS** – The European University for Smart Urban Coastal Sustainability
Prof Spyridon Kintzios, Rector, Agricultural University of Athens

15:15 – 15:30 **EULiST** – The European Universities Linking Society and Technology
Prof Sotirios Karellas, National Technical University of Athens

15:30 – 15:45 **EUNICoast** – The European University of Islands, Ports and Coastal Territories
Prof Konstantinos Kounetas, University of Patras

15:45 – 16:00 **EURECA-PRO** – The European University on Responsible Consumption and Production
Prof Konstantinos-Alketas Oungrinis, Vice Rector, Technical University of Crete

16:00 – 16:15 **INVEST** – The Competitive University for a Sustainable Society
Prof Nikolaos Samaras, University of Thessaly

16:15 – 16:30 **EUonAIR** – European University on AI in Curricula, Smart UniverCity and (Return) Mobility
Prof Maria Psillaki, University of Piraeus

EU-CONEXUS Opportunities for Students (BSc, MSc & PhD) (achievements and prospects)

Chair: **Ms Christina Zantioti** *(Agricultural University of Athens)* & **Mr Bogdan Gheorghe** *(Technical University of Civil Engineering of Bucharest)*

16:30 – 16:50 EU-CONEXUS Opportunities for Students
Prof Ilinca Năstase, Vice Rector, Technical University of Civil Engineering of Bucharest

16:50 – 17:00 EU-CONEXUS Students' Voices
Ms Athanasia Elli Stefanaki, Student Board member & Minor student
Ms Ioanna Pergamali, Micro-credential student
Ms Panagiota Mallouhou, SRH and OLH student
Ms Christina Anna Stafyli, Student Joint Master Programme in Marine Biotechnology

17:00 – 17:30 **COFFEE BREAK**

Wednesday

June 10, 2026

Agricultural University of Athens,
75 Iera Odos, Athens 11855
Main Venue: Conference Center

"BREAK THE ICE" *(Multiple Locations)*

17:30 – 19:00

A) Find your future Collaborators/Employers/Supervisors
(for Faculty members, Researchers, Postgraduate Students, Representatives of non-Scientific Entities, Managers)

— **Session 1: Soil Preservation/Restoration, Healthy Food Production, Disease Management: Innovation and Socio-Cultural Governance**

Moderators: **Prof Dimitrios Skliros & Dr Katerina I. Kalliampakou** *(Agricultural University of Athens)*

⚲ Conference Center

— **Session 2: Protection of Oceans, Seas & Waters and Sustainable Coastal Waste Management through Socio-Ecological Transitions**

Moderators: **Dr Evanthia Chatzoglou & Ms Christina Zantioti** *(Agricultural University of Athens)*

⚲ Election Hall of the Central Administration Building (1st Floor)

— **Session 3: Infrastructure & Nature Based Solutions for Disaster Risk Reduction and Climate Change Adaptation with Local Knowledge & Cultural Practices**

Moderators: **Prof Dimitrios P. Vlachakis & Dr Eleni Papakonstantinou** *(Agricultural University of Athens)*

⚲ Multi-Purpose Hall of the Central Administration Building (2nd Floor)

B) Workshop: How to Communicate Your Science
(for Undergraduate Students)

Moderator: **Student Team "DNA Voyagers"**

⚲ Frangopoulou Auditorium

19:00 – 22:30 **Welcome Cocktail Party at the Courtyard of the Agricultural Museum of AUA**

Parallel all-day activity:
EU-CONEXUS ENABLES Hackathon "Gamifying Agricultural & Biotech Education"
⚲ Multi-Purpose Hall of the Agricultural Museum

Thursday

June 11, 2026

Technopolis City of Athens
100 Pireos Street, Athens, 118 54
Main Venue: Gasholder 1–Auditorium "Miltiadis Evert"

AUA **Research & Innovation Booths** will be hosted at the Purifier venue throughout the event.

08:20 – 08:50 Registration

08:50 – 09:00 Welcome

— **Prof Eleni Miliou**, Vice Rector for European University, Internationalization and Student Affairs, Agricultural University of Athens

SESSION 2:

Protection of Oceans, Seas & Waters and Sustainable Coastal Waste Management through Socio-Ecological Transitions

Chair: **Prof Shiau Pin (Graece) Tan** *(South East Technological University)* & **Prof Arturas Razinkovas-Baziukas** *(Klaipeda University)*

09:00 – 09:30 Keynote Lecture

From Data to Decisions: The Missing Link in Coastal Sustainability

Dr Cristina Huertas-Olivares, European Research Infrastructure Consortium LifeWatch ERIC

09:30 – 11:00 Short Talk 1

Isolation, Characterization and *In Vitro* Adaptive Evolution of Biodegrading Environmental Bacteria of Poly(3-Hydroxybutyrate) for Recycling Purposes

Prof Dimitrios Skliros, Agricultural University of Athens

Short Talk 2

Development of IMTA in the Adriatic Sea – A Path to More Ecologically and Economically Sustainable Aquaculture Practices

Prof Ivan Župan, University of Zadar

Short Talk 3

Modelling Eutrophication Dynamics for Sustainable Coastal Management: Application of the EUTROPY Model in the Curonian Lagoon

Burak Kaynaroglu, PhD Student at Klaipeda University

Short Talk 4

UAV Multispectral and Hyperspectral-Informed Monitoring of Invasive Coastal Vegetation in Ireland for Policy-Driven Coastal Management

Fionn Farrell, PhD Student at South East Technological University

Short Talk 5

Machine Learning from Stakeholder Knowledge for Social-Ecological Systems Modelling

Prof Arturas Razinkovas-Baziukas, Klaipeda University

Short Talk 6

From Damage to Restoration: Civil Liability, Full Reparation and Coastal Ecosystem Governance Under EU Law

Prof Marie-Sophie Bondon, La Rochelle Université

11:00 – 11:30 **COFFEE BREAK** **Purifier**

11:30 – 12:00 Keynote Lecture

Ecosystem Modeling: From Phys 2 Fish

Dr George Triantafyllou, Research Director, Hellenic Centre for Marine Research - Institute of Oceanography

12:00 – 12:30 Free Discussion

SESSION 3:

Infrastructure & Nature Based Solutions for Disaster Risk Reduction and Climate Change Adaptation with Local Knowledge & Cultural Practices

Chair: **Prof Agnė Šneiderienė** *(Klaipeda University)* & **Prof Zvjezdan Penezić** *(University of Zadar)*

12:30 – 13:00 Keynote Lecture

Seismic Resilience of Existing Buildings in Romania: Technical Regulations, Retrofitting Challenges and Environmental Trade-Offs

Prof Viorel Popa, Vice Rector, Department of Reinforced Concrete Constructions, Technical University of Civil Engineering of Bucharest

13:00 – 14:30 **LUNCH BREAK** **Purifier**

14:30 – 16:00 Short Talk 1

Cascading Events in Coastal Environments and Their Impact on Critical Infrastructure

Pieris Panagi, PhD Student at Frederick University & University of Rostock

Short Talk 2

Twinning Ecologies: Representing Interdependence Across More-Than-Human Authors in a Coastal Landscape Digital Twin

Dr Emily Kim & Dr Emily Shakespeare, South East Technological University

Thursday

June 11, 2026

Technopolis City of Athens
100 Pireos Street, Athens, 118 54
Main Venue: Gasholder 1–Auditorium "Miltiadis Evert"

Short Talk 3

Encoding Ecologies: Technical Challenges of Representing More-than-Human Authors in a Coastal Digital Twin

Dr Sinéad Barnett & Dr Robin Stubbs, South East Technological University

Short Talk 4

GNSS-Based Ionospheric Monitoring of Tsunami-Induced Disturbances as a Potential Early Warning Tool

Dr Krishnendu Sekhar Paul, Frederick University

Short Talk 5

Meteotsunami-Driven Saline Intrusions in the Curonian Lagoon

Dr Laura Nesteckytė, Klaipeda University

Short Talk 6

Advanced Wind and Seismic Resilience-Targeted Evaluation of Civil Infrastructure at City-Scale Level

Prof Mihail Iancovici, Technical University of Civil Engineering of Bucharest

16:00 – 16:30 Keynote Lecture

Architected Reefs: Offer Exceptional Coastal Storm Protection at Much Lower Cost

Prof Michael Triantafyllou, Director of the MIT Sea Grant Program, Henry L. and Grace Doherty Professor in Ocean Science & Engineering in the Department of Mechanical Engineering at the Massachusetts Institute of Technology

16:30 – 17:00 Free Discussion

17:15 – 19:30 **Cultural Tour:** Guided Tour of the Acropolis Museum, followed by a walking tour through the historic center of Athens, including Vyronos Street, the Monument of Lysicrates, the Roman Agora, and concluding in Monastiraki.

Parallel all-day activity:

EU-CONEXUS ENABLES Hackathon "Gamifying Agricultural & Biotech Education"

INNOVATHENS

Friday
June 12, 2026

Technopolis City of Athens
100 Pireos Street, Athens, 118 54

AUA **Research & Innovation Booths** will be hosted at the Purifier venue throughout the event.

08:30 – 09:00 Registration

09:00 – 11:00 Posters' Session **Purifier**

11:00 – 11:30 **COFFEE BREAK** **Purifier**

PARALLEL ROUND TABLES *(Multiple Locations)*

11:30 – 13:00

Round Table 1:

The role of science and society in the "One Health" approach. How easy are the solutions proposed by science to be implemented in practice and adopted by society and government?

Moderator: **Prof Sofia Mavrikou**, Agricultural University of Athens

Keynote Lecture

Safe and Sustainable by Design: Translating food science innovation into food industry practice

Prof Theofania Tsironi, Laboratory of Food Process Engineering, Department of Food Science and Human Nutrition, Agricultural University of Athens

Round Table Panel

- **Prof Theofania Tsironi**, Agricultural University of Athens
- **Dr Philipp Wree**, Fraunhofer Institute for Computer Graphics Research
- **Prof Lukáš Kalous**, Czech University of Life Sciences Prague
- **Prof Nazgol Emrani**, University of Rostock
- **Prof Zvjezdan Penezić**, University of Zadar
- **Prof Dimitrios P. Vlachakis**, Agricultural University of Athens
- **PhD Student Mareeha Rafiq**, Agricultural University of Athens

Gasholder 1–Auditorium "Miltiadis Evert"

Round Table 2:

How can we reduce the impact of our civilization on the environment? How easy are the solutions proposed by science to be implemented in practice and adopted by society and government?

Moderator: **Dr Evanthia Chatzoglou**, Agricultural University of Athens

Keynote Lecture

Advancing Blue Economy Sustainability through Participatory Ecosystem Protection - Restoration and Smart Decision-Support Tools

Prof Stefan Mihai Petrea, Vice-dean of the Food Science and Engineering Faculty, "Dunărea de Jos" University of Galati

Round Table Panel

- **Prof Stefan Mihai Petrea**, "Dunărea de Jos" University of Galati
- **Dr Cristina Huertas-Olivares**, European Research Infrastructure Consortium LifeWatch ERIC
- **Prof Emmanouil Malandrakis**, Agricultural University of Athens
- **Prof Marie-Sophie Bondon**, La Rochelle Université
- **Prof Charalambos Chasos**, Frederick University
- **Prof Ivan Župan**, University of Zadar
- **PhD Student Edita Lenkauskaite**, Klaipeda University

INNOVATHENS (Ground Floor)

Round Table 3:

Are sustainable coastal cities a utopia? How can we improve existing infrastructure and redesign our coastal cities to make them sustainable? How easy are the solutions proposed by science to be implemented in practice and adopted by society and government?

Moderator: **PhD Student Christos Vatistas**, Agricultural University of Athens

Keynote Lecture

Strategic Sustainability Communication for Stakeholder Engagement: From One Way Information to Dialogic Responsibility Mindset Building

Lecturer Viktorija Jakubauskytė-Andriulienė, Lecturer in Communication, LCC International University (Klaipeda) and Vilnius Gediminas technical University (Vilnius)

Round Table Panel

- **Lecturer Viktorija Jakubauskytė-Andriulienė**, LCC International University (Klaipeda) and Vilnius Gediminas technical University (Vilnius)
- **Prof Viorel Popa**, Technical University of Civil Engineering of Bucharest
- **Prof Remigijus Dailidė**, Klaipeda University
- **Lecturer Irene Angastinioti**, Frederick University
- **Prof Catalin Ioan Teodosiu**, Technical University of Civil Engineering of Bucharest
- **Dr Yvonne Kavanagh**, South East Technological University
- **Ms Katerina Papadouli**, Agricultural University of Athens
- **PhD Student Pieris Panagi**, Frederick University & University of Rostock

INNOVATHENS (1st Floor)

13:00 – 14:30 LUNCH BREAK Purifier

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PARALLEL WORKSHOPS ON EU CALLS *(Multiple Locations)*

14:30 – 16:00

— **Soil Preservation/Restoration, Healthy Food Production, Disease Management: Innovation and Socio-Cultural Governance**

Moderator: **Ms Bianca Mătăsariu** *(Technical University of Civil Engineering of Bucharest)*

Gasholder 1–Auditorium "Miltiadis Evert"

— **Protection of Oceans, Seas & Waters and Sustainable Coastal Waste Management through Socio-Ecological Transitions**

Moderator: **Ms Lucie Vaucel** *(La Rochelle Université)*

INNOVATHENS (Ground Floor)

— **Infrastructure & Nature Based Solutions for Disaster Risk Reduction and Climate Change Adaptation with Local Knowledge & Cultural Practices**

Moderator: **Ms Adriana Samanaru** *(Technical University of Civil Engineering of Bucharest)*

INNOVATHENS (1st Floor)

— **Funding Opportunities for beginners**

Moderators: **Ms Christina Constantinidou** *(Frederick University)* & **Ms Léa Hauviller** *(La Rochelle Université)*

Purifier (Lower Level)

16:10 – 18:00

EU-CONEXUS ENABLES Hackathon Showcase and Awards: "Gamifying Agricultural & Biotech Education"

Chair: Dr **Aikaterini Koletti** *(Agricultural University of Athens)*

Jury: Prof **Sofia Mavrikou** *(Agricultural University of Athens)*
Prof **Dimitrios P. Vlachakis** *(Agricultural University of Athens)*
Prof **Helen Hughes** *(South East Technological University)*
Lecturer **Rachel O Dowd** *(South East Technological University)*
Ms **Sabine Brueser** *(University of Rostock)*

Presentation of Awards by Prof **Ilinca Năstase** *(University of Civil Engineering of Bucharest)*

Gasholder 1–Auditorium "Miltiadis Evert"

18:00 – 19:30

Closing Ceremony

Purifier

Posters | Friday

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POSTERS OF SESSION 1:

Soil Preservation/Restoration, Healthy Food Production, Disease Management: Innovation and Socio-Cultural Governance

P01 **Good Food, Good Feelings: Exploring Body Image and the Mediterranean Diet**
Presenter: **Zvjezdan Penezić**, University of Zadar

P02 **Consumer Perceptions of Insect-Based Food: From Topic Modeling of Associations to Consumption Intentions**
Presenter: **Krešimir Jakšić**, University of Zadar

P03 **Transforming food supply routines through digital access: analysis of the role of the smartphone in changing practices**
Presenter: **Natalia Suarez Moya**, La Rochelle Université

P04 **Dietary TMAO-induced inflammation produces changes in social behavior**
Presenters: **Ana Perez-Villalba, Alicia Saelices-Lillo, Belén Frígols Garrido, David Alburquerque-Bravo**, Catholic University of Valencia

P05 **Brain Resilience: Open-Skill vs. Closed-Skill Exercise in Mild Cognitive Impairment Treatment**
Presenters: **Alonso Sanchez-Rodriguez, Julia Deltiempo-Martínez**, Catholic University of Valencia

P06 **Multicomponent exercise training to prevent cognitive decline in older adults with mild cognitive impairment**
Presenter: **Elena Sanz Cariñena**, Catholic University of Valencia

P07 **From Sensing to Healing: A Real-Time Biofeedback System for Mental Health Management in Older Adults**
Presenter: **Malik Faizan**, Walton Institute, South East Technological University

P08 **Genetic variability in antioxidant enzymes SOD2 and CAT and clinical heterogeneity of multiple sclerosis**
Presenter: **Maria Papasavva**, Frederick University

P09 **L-Dopa Decarboxylase Mediates Apoptosis Through Regulation of PI3K/AKT Pathway in Response to DENV Infection**
Presenter: **George Mpekoulis**, Hellenic Pasteur Institute

P10 **Effects of overland flow mechanisms on phosphorus export from grassland soils**
Presenter: **Patricia Roche**, Eco-Innovation Research Centre (EIRC), South East Technological University

P11 **The Role of Endomycorrhizal Fungi in Irish Fen Restoration**
Presenter: **Woody Bennett**, South East Technological University

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P12 **A rhizobial xanthine/uric acid transporter affects the bioenergetic metabolism of the nodule in Medicago truncatula – Sinorhizobium meliloti symbiosis**
Presenter: **Katerina I. Kalliampakou**, Agricultural University of Athens

P13 **Molecular Targeting of FAR Proteins in Plant-Parasitic Nematodes: A Step Towards Sustainable Crop Protection**
Presenter: **Maria-Eirini Lekka**, Agricultural University of Athens

P14 **Enhancing Maize Resilience to Combined Drought and *Fusarium proliferatum* Stress via Root Endophytic Symbiosis with *Serendipita indica***
Presenter: **Fatemeh Noori**, Gorgan University of Agricultural Sciences and Natural Resources & University of Rostock

P15 **Screening of novel bio-based recycling fertilizers to evaluate their effects on germination, nutrient uptake and biomass yield in selected crops**
Presenter: **Paul Fromund Klatt**, University of Rostock

P16 **Harnessing Algae-Derived Biostimulants to Enhance Crop Resilience and Productivity: A Multi-Omics and Digital Twin Approach**
Presenter: **Mareeha Rafiq**, Agricultural University of Athens; Institute of Environment and Marine Science Research (IMEDMAR), Catholic University of Valencia

P17 **Electrochemical Detection of Azoxystrobin in Lettuce Matrices via Molecularly Imprinted Polymers**
Presenter: **Anastasios Manolopoulos-Dekaristos**, Agricultural University of Athens

P18 **Isolation of Fungi from Environmental Sources and TLC Screening for Ochratoxin A in Wine and Beer Samples**
Presenter: **Klara Rušev**, University of Zadar

P19 **Microbial community and spoilage development in refrigerated marine fish during cold chain distribution and storage**
Presenter: **Evgenia Basdeki**, Agricultural University of Athens

P20 **Predictive modelling for fish and seafood processing and preservation**
Presenters: **Héctor Castarlenas Cequier**, Catholic University of Valencia & **Evmorfia Athanasopoulou**, Agricultural University of Athens

P21 **Influence of fish meal and fish oil replacement on the plasma biochemical profile of European sea bass (*Dicentrarchus labrax*)**
Presenter: **Evanthia Chatzoglou**, Agricultural University of Athens

P22 **From anti-biofilm activity to anticancer potential: investigation of metabolites produced by marine bacterial consortia**
Presenter: **Émile Bonnenfant**, La Rochelle University

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P23 **Unveiling Tocopherol production in *Tetradesmus obliquus*: From spectrophotometric stress monitoring to multi-omics analysis**
Presenter: **Jeronimo Chirivella-Martorell**, Institute of Environment and Marine Science Research (IMEDMAR), Catholic University of Valencia

P24 **Blue Biomass for Sustainable Packaging: Biobased Films from Microalgal Whole Biomass and Exopolysaccharides**
Presenter: **Christina Anna Stafyli**, Agricultural University of Athens

P25 **Fighter Tomatoes: Regenerative Packaging and Circular Consumer Engagement in Sustainable Food Marketing**
Presenters: **Balma Chulvi Bernad**, **Mario Ferrandez Sania**, **Juan Esteban Caicedo Rodríguez**, Catholic University of Valencia

P26 **Equal benefits from different methods? A comparative study of Salvia officinalis decoction and infusion**
Presenter: **Zacharias-Sotirios Mantzourakis**, Agricultural University of Athens

P27 **Comparative evaluation of bioactive and antimicrobial properties in decoction and infusion beverages of Origanum vulgare L. spp. hirtum**
Presenter: **Anna Petrou**, Frederick University

P28 **Natural Products from Salvia willeana and Salvia fruticosa as Potential Agents for Eco-Friendly Control of Cyanobacterial Blooms**
Presenter: **Despina Charalambous**, Frederick University

P29 **Novel use of materials such as seaweed, green tea and shells in antimicrobial wound dressings.**
Presenter: **Helen Hughes**, South East Technological University

P30 **Simulation of wheat thermal behavior in metal silos for grain storage**
Presenter: **Adrian-Gabriel Ghiaus**, Technical University of Civil Engineering of Bucharest

P31 **Genetic Identification of Mosquitoes in Ireland using a multi-sampling approach of direct and indirect samples**
Presenter: **Thomas Curran**, South East Technological University

P32 **Reframing Disease Management through Educational Innovation: an interdisciplinary postgraduate model for health system capacity building**
Presenter: **Anthi Xenofondos**, Frederick University

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POSTERS OF SESSION 2:

Protection of Oceans, Seas & Waters and Sustainable Coastal Waste Management through Socio-Ecological Transitions

P33 **A peptide-decorated *PilA* biosensor in *E. coli* for real-time environmental biosensing**
Presenter: **Georgia Samolada**, Democritus University of Thrace / iGEM ProDeGenes

P34 **ARMS-MBON technology for environmental monitoring in ports**
Presenter: **Victor Tena-Gasco**, Institute of Environment and Marine Science Research (IMEDMAR), Catholic University of Valencia

P35 **Variations in environmental water quality in port marine environments: a comparative study under altered conditions**
Presenter: **Victor Tena-Gasco**, Institute of Environment and Marine Science Research (IMEDMAR), Catholic University of Valencia

P36 **Using urban stormwater & rainwater as alternative sources to sustain urban lakes**
Presenter: **Mukupa M. Miller**, Technical University of Civil Engineering of Bucharest

P37 **Waste shells as low-cost materials for wastewater treatment and nutrient recovery**
Presenter: **Shiau Pin Tan**, Eco-innovation Research Centre (EIRC)/Pharmaceutical and Molecular Biotechnological Centre (PMBRC), South East Technological University

P38 **Methodology for Imputation of the Irish Soil Permeability Map**
Presenter: **Anne Crowley**, South East Technological University

P39 **Optimisation of ethanol-based phenolic Solid-Liquid Extraction from fig leaf waste**
Presenter: **Angeliki Xyderou Malefaki**, University of Huddersfield, Huddersfield

P40 **Healing attempts of Pinna nobilis individuals using phytotherapy**
Presenter: **José Francisco Sánchez de Prado**, Institute of Environment and Marine Science Research (IMEDMAR) & Doctoral School, Catholic University of Valencia

P41 **Transcriptome analysis of neural and gonadal tissues of Pinna nobilis Linnaeus, 1758 and P. rudis**
Presenter: **José Francisco Sánchez de Prado**, Institute of Environment and Marine Science Research (IMEDMAR) & Doctoral School, Catholic University of Valencia

P42 **Multidisciplinary oceanographic research in coastal ecosystems: análisis of biological, physical and chemical data**
Presenter: **Héctor Castarlenas Cequier**, Catholic University of Valencia

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P43 **CABALGA II: Innovative and inclusive approaches for the recovery and conservation of benthic communities in the Mediterranean, Atlantic and Cantabrian Seas**
Presenter: **Raquel Torres,** Institute of Environment and Marine Science Research (IMEDMAR) & Doctoral School, Catholic University of Valencia

P44 **From jellyfish bycatch to marine collagen: circular bioeconomy opportunities for small-scale fisheries**
Presenter: **Raquel Torres,** Institute of Environment and Marine Science Research (IMEDMAR) & Doctoral School, Catholic University of Valencia

P45 **First results of characterization of the impact of microplastics on Mediterranean temperate corals.**
Presenter: **Christian Ghiroldi,** Institute of Environment and Marine Science Research (IMEDMAR) & Doctoral School, Catholic University of Valencia

P46 **Impacts of offshore wind farm construction on grey and harbour seals in the *Baie de Somme* (English Channel)**
Presenter: **Sarah Jeangeorges**, La Rochelle Université

P47 **Microplastic Generation from the Leading Edge of Offshore Wind Turbine Blades: An Emerging Environmental Concern**
Presenter: **Mohammadhassan Badihehaghdam**, The Center for Research and Enterprise in Engineering, South East Technological University

P48 **Environmental Drivers of Gilthead Sea Bream Holobiont: Integrating Growth Performance, Blood Biochemistry, Gene Expression and Multi-Compartment Microbiota under Temperature and Salinity Variation**
Presenter: **Mario Ferrández Sanía**, Catholic University of Valencia

P49 **DIAGNOSIS OF FISH DISEASES WITH THE USE OF MOLECULAR METHODS**
Presenters: **Theodosios Dimitriadis, Despoina Kyriazaki, Anastasios Stefanos Polygarakis, Eleftheria Maria Myrto Gkritzapi**, Agricultural University of Athens

P50 **Effects of chlorine-induced stress on physiological and biochemical characteristics of the marine diatom *Phaeodactylum tricornutum***
Presenter: **Evaggelos Kefalogiannis**, Agricultural University of Athens

P51 **Thriving in salt: Adaptive physiological and biochemical responses of *Dunaliella* sp. SKE07 to hypersaline stress**
Presenter: **Stefanos Ploumis,** Agricultural University of Athens

P52 **Insights into microalgal stress adaptation: the roles of *Cr*SBD1 and *Cr*CEP2**
Presenter: **Aikaterini Koletti**, Agricultural University of Athens

P53 **Mixotrophic cultivation of *Scenedesmus quadricauda* using waste frying sunflower oil: effects on growth and physiological response**
Presenter: **Spyridon Raftopoulos**, Agricultural University of Athens

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P54 **Aeration systems for sustainable hydropower: protecting aquatic ecosystems in coastal river basins**
Presenter: **Paul Alexandru Danca**, CAMBI Research Center, Technical University of Civil Engineering of Bucharest & National Institute for R&D in Electric Engineering (ICPE-CA)

P55 **Interactive Web-Based Platform for Visualization of Operational Marine Forecasts**
Presenter: **Rasa Idzelytė**, Marine Research Institute, Klaipeda University

P56 **Numerical simulation of wave equations using multi-relaxation-time lattice boltzmann approach**
Presenter: **Bouthaina Yousfi**, La Rochelle Université & University of Tunis El Manar

P57 **CFD modelling and simulation of ammonia flow processes in internal combustion engines for zero-carbon transportation**
Presenter: **Charalambos Chasos**, Frederick University

P58 **Cellular Materials for Sustainable Protection Systems: Modelling Approaches for Reducing Environmental Impact in Coastal Logistics**
Presenter: **Farzaneh Khast**, South East Technological University

P59 **A STEM-Based Approach to Modeling Wave–Structure Interaction in Coastal Engineering Education**
Presenter: **Tudor Macavei**, Technical University of Civil Engineering Bucharest

P60 **Modeling and Optimization of Coastal Structural Systems Using Mathematical and Mechanical Approaches in Engineering Education**
Presenter: **Valentina Iuliana Manea**, Technical University of Civil Engineering Bucharest

P61 **Linear Programming Applications for Optimizing Coastal Waste Management Systems in Engineering Education**
Presenter: **Ion Mierluș-Mazilu**, Technical University of Civil Engineering Bucharest

P62 **Multi-Criteria Decision-Making for Sustainable Coastal Infrastructure Management in Engineering Education**
Presenter: **Raluca Ioana Grasu**, Technical University of Civil Engineering Bucharest

P63 **Understanding Sustainable Travel Intentions in Regional Aviation: Behavioural Constraints and the Theory of Planned Behaviour**
Presenter: **Amy Lynn Whelan**, South East Technological University

P64 **Reimagining Coastal Sustainability Education: Digital Pedagogical Design for Transitions in Blue Tourism**
Presenter: **Neill Wylie**, South East Technological University

P65 **A blended learning model for maritime studies as a capacity-building pathway for sustainable coastal development**
Presenter: **Tartios Christiana**, Frederick University

P66 **Species literacy & coastal ecology: A design-based-research project on game-based science education and communication**
Presenter: **Tom Bewersdorf**, University of Rostock

P67 **Game-based learning of coastal ecology: An intervention study on the impact of GBL on students' intrinsic motivation**
Presenter: **Emanuel Nestler**, University of Rostock

P68 **Governance Intelligence for Socio-Ecological Transitions: Reflexive Decision-Making and the Role of European University Alliances**
Presenter: **Edita Lenkauskaite**, Klaipeda University

P69 **SRH - Biodiversity survey and interpretation assessment of Copper Coast UNESCO Global Geopark in Co. Waterford, Ireland**
Presenter: **Aoife Murphy**, South East Technological University

P70 **SRH - Applications of computational fluid dynamics (CFD) and computational mechanics (CM) for sustainable and secure transport systems at coastal and urban areas – Outcomes and Prospects**
Presenter: **Adonis Vasiliou**, Frederick University

POSTERS OF SESSION 3:
Infrastructure & Nature Based Solutions for Disaster Risk Reduction and Climate Change Adaptation with Local Knowledge & Cultural Practices

P71 **Resilient Roadside Infrastructure for the Electric Vehicle Era: Rethinking Guardrail Performance for Future Transport Safety**
Presenter: **Adonis Vasiliou**, Frederick University

P72 **SRH-Natural language processing (NLP) for climate research: Practical text analysis workflows**
Presenter: **Krešimir Jakšić**, University of Zadar

P73 **Sustainable Retrofit Strategies for Traditional Timber Houses**
Presenter: **Ancuța Neagu**, Research, Development and Innovation Management Center, Technical University of Civil Engineering Bucharest

P74 **Numerical evaluation of airflow and heat exchange within lightweight wall boards equipped with interconnected PV panels**
Presenter: **Cătălin Ioan Teodosiu**, CAMBI Research Center, Technical University of Civil Engineering of Bucharest

P75 **Preliminary tests on the resistance capacity of wooden elements exposed to marine environment of the Black Sea Region**
Presenter: **Ruxandra Erbasu**, Technical University of Civil Engineering Bucharest

P76 **Development of a dynamic material passports framework for sustainable and circular urban coastal construction**
Presenter: **Ioannis Markou**, South East Technological University

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P77 **Robot-Assisted Monitoring of Historic Buildings in Coastal Urban Environments: Innovative Solutions for the Sustainable Protection of Built Heritage**
Presenter: **Ioan Mihail Savaniu**, Technical University of Civil Engineering Bucharest

P78 **Modeling of Soil–Structure Interaction in Coastal Environments Using a STEM-Based Learning Approach**
Presenter: **Adrian-Alexandru Savu**, Technical University of Civil Engineering Bucharest

P79 **Quantifying seismic risk and financial resilience in Bucharest through EAL, PML and Tail Risk metrics**
Presenter: **Bogdan Gheorghe**, Technical University of Civil Engineering Bucharest

P80 **Risk-Based Management of Coastal Urban Systems Using Statistical and Decision Models**
Presenter: **Ramona Silvestru**, Technical University of Civil Engineering Bucharest

P81 **Financing urban resilience: the role of crowdfunding in green infrastructure development**
Presenter: **Nico Wille**, University of Rostock

P82 **Bridging the Data-Policy Gap: A Framework for Leveraging Mobility Data in SDG-Aligned Coastal Urban Governance**
Presenter: **Fatemeh Hosseinpour Berenjabad**, University of Rostock

P83 **Leadership styles enabling organizational ambidexterity for strategic value creation in coastal climate adaptation: the role of collaboration and local knowledge systems**
Presenter: **Aurimas Labanauskas**, Klaipeda University

P84 **Green Skills for Organizational Resilience**
Presenter: **Agnė Šneiderienė**, Klaipeda University

P85 **Empowering Girls in STEM as a Capacity-building Pathway for Climate Adaptation and Coastal Resilience**
Presenter: **Irene Angastinioti**, Frederick University

P86 **Scaling Inclusive Pedagogy: A Transnational Practice Journey from Zadar to Seville**
Presenters: **Clare Martin, Deirdre Grant**, South East Technological University

P87 **Comparison of traditional and modern teaching methods in higher education: perspectives of students and professors**
Presenter: **Lucija Kolarec**, University of Zadar

P88 **Promoting Sustainable Coastal Tourism with AI? Evidence from Student Campaign Development for a Coastal Destination**
Presenter: **Michelle Clancy**, South East Technological University

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P89 **Coastal Resilience and Sustainability (CoReS): a diamond open access journal for a sustainable future**
Presenter: **Drahomira Cupar**, University of Zadar

P90 **Environmental Anxiety and Coping: How Do Youth in Coastal Regions Cope with Climate Change?**
Presenter: **Alexios Kavvouras**, Agricultural University of Athens

P91 **Sea-breeze fronts as indicators for climate adaptation and health risks in Baltic coastal environments**
Presenter: **Remigijus Dailidė**, Klaipeda University

P92 **Water quality in Mediterranean coastal lagoons: optical remote sensing and in situ validation for assessing the severity of torrential floods**
Presenter: **Juan Esteban Caicedo Rodriguez**, Catholic University of Valencia

P93 **Hydrodynamic Model-Based Analysis of Marine Heatwaves in the Southeastern Baltic Sea**
Presenter: **Inesa Servaitė**, Klaipeda University

P94 **Shore-based monitoring of suction dredgers operating in sensitive coastal zones: artificial vision systems for preventing entry into protected areas**
Presenter: **Andrei Busca**, Technical University of Civil Engineering Bucharest

P95 **A Bioregional Partnership Approach to Address Biodiversity Challenges in Ireland's South East**
Presenter: **Andrew Madigan**, South East Technological University

P96 **Evaluation of Olive Cultivars for Urban Environments: Morphological Traits, Health Status and Urban Suitability**
Presenter: **Luka Mičić**, University of Zadar

P97 **Comparative Genomic Analysis of Salt and Drought Resilience in Rhizobia Isolated from *Trifolium* and *Medicago* Species**
Presenter: **Emmanouil Zoanos**, Agricultural University of Athens

P98 **Optimisation of non-invasive genetic tools to monitor populations of common pipistrelle (*Pipistrellus pipistrellus)* and soprano pipistrelle (*Pipistrellus pygmeus)* bats in a Living Lab**
Presenter: **Fleuryne Esteve**, La Rochelle Université

P99 **PS-II biosensing of Ametryn: Sensitive detection using *Lemna minor* thylakoids**
Presenter: **Ioanna Amaslidou**, Agricultural University of Athens

P100 **In-Situ Decarbonization of SMR Hydrogen: A Comparative Exergy-Machine Learning Framework for Blue & Green Hydrogen Ascendancy**
Presenter: **Abdullah Hasni**, NED University of Engineering & Technology

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P101 **Twinning ecologies: representing interdependence across more-than-human authors in a coastal landscape digital twin**
Presenter: **Emily Kim**, South East Technological University

P102 **Encoding Ecologies: Technical Challenges of Representing More-than-Human Authors in a Coastal Digital Twin**
Presenter: **Sinéad Barnett**, South East Technological University

P103 **The relationship between dark triad traits, empathy, and altruism across professional contexts**
Presenter: **Zvjezdan Penezić**, University of Zadar

P104 **DNA Voyagers**

Livestream Links

Watch Wednesday's Live Stream

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Watch Thursday's Live Stream

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Watch Friday's Live Stream

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Short Talks Abstracts / Session 1

Multi-Scale Soil Texture Prediction Using Multi-Temporal Sentinel-1 and Sentinel-2 Data and Machine Learning

Swen Meyer[1]*, Phil Förg[1], Jörg Ruehlmann[2], Eric Bönecke[2], Philip Marzahn[1]

(1) Chair of Geodesy and Geoinformatics, Faculty of Agriculture, Built Environment and Environmental Sciences, University of Rostock, Rostock, Mecklenburg-Western Pomerania, Germany
(2) Leibniz Institute of Vegetable and Ornamental Crops, Großbeeren, Brandenburg, Germany

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Sustainable soil management is a key prerequisite for soil preservation, ecosystem resilience, and healthy food production. Soil texture strongly controls water availability, nutrient retention, and microbial habitat conditions, thereby, for example, influencing crop productivity. However, spatially detailed soil information is still lacking in many agricultural regions, limiting the implementation of site-specific management strategies and evidence-based governance approaches.

This study presents an Earth observation–based framework to derive high-resolution topsoil clay, silt and sand information of the upper 30 cm soil layer across multiple spatial scales. Random Forest models were trained to predict the topsoil texture fractions using multi-temporal Sentinel-1 (S1) and Sentinel-2 (S2) satellite data together with terrain parameters. Predictor variables included long-term temporal statistics from S1 (radar backscatter) and S2 (spectral reflectance) under vegetated and bare-soil conditions from 1 January 2017 to 31 December 2025. Temporal mean values and coefficients of variation (CV) were used to capture stable soil-related signals while reducing short-term variability caused by weather and vegetation dynamics.

Model training and evaluation were conducted across three spatial scales: farm/field-scale datasets (1167 reference points from three smart farming projects), regional datasets (three German federal states with 1452 sample points), and a national dataset (combined dataset including LUCAS 2009 with 3203 sample points).

Across all three texture fractions, predictive performance was highest at the farm scale (R^2 0.53–0.79; RMSE 3.0–9.7%). Regional models showed moderate performance (R^2 0.42–0.79). At the national scale, clay predictions remained comparatively stable (RMSE 6–7%), while the RMSE of the best silt and sand predictions ranged between 11% and 13% (R^2 0.60–0.78), reflecting the increasing heterogeneity of soil-forming factors with spatial extent.

The resulting 10 m resolution soil texture maps provide spatially explicit information relevant for soil conservation, restoration, and sustainable intensification. High-resolution soil data can support improved management of fertilization, water retention, erosion risk, and soil resilience. The predicted maps are currently available for Germany.

From Molecules to Coastlines: An R&D Pipeline on Biologicals for Sustainable Urban-Coastal Agriculture

Christos. N. Kerezoudis[1*], Sotirios Giannakaris[1*], Ioannis F. Kalampokis[1‡], Konstantinos A. Aliferis[1‡]

[1]Agricultural University of Athens, Laboratory of Pesticide Science, Biostimulant, Biocontrol, & Pesticide Metabolomics Group, B²PMG, Iera Odos 75, Athens, 118 55

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The transition toward sustainable agricultural systems is a central pillar of European policy, as articulated in Regulation (EU) 2021/2115 and the European Green Deal, with the Farm to Fork Strategy setting ambitious targets for a 50% reduction in the use and risk of chemical pesticides and a 25% expansion of organic farming by 2030. These objectives are particularly critical within coastal and peri-urban agroecosystems, where agricultural practices directly influence water quality, ecosystem integrity, and urban food systems. Within this context, biostimulants and biocontrol agents emerge as key enablers of climate-resilient and environmentally compatible agriculture. These bio-based inputs, including seaweed-derived products, plant growth-promoting microorganisms, humic substances, and protein hydrolysates, alongside targeted biocontrol agents, enhance plant performance through improved nutrient use efficiency, stress tolerance, and modulation of plant metabolic networks. Here, our integrated R&D pipeline on biologicals, spanning discovery, metabolomics-driven mechanistic elucidation, formulation optimization, and field-scale validation of biostimulants and biocontrol agents under environmentally sensitive coastal conditions are presented. The pipeline is designed to bridge laboratory-scale insights with real-world performance, enabling the identification of bioactive candidates, the decoding of their mode(s) of action at the metabolic level, and the development of robust formulations with consistent efficacy. Particular emphasis is placed on the application of advanced analytical platforms, including advanced metabolomics, to resolve plant responses to biological inputs and to support mechanism-informed product development. This approach allows for the optimization of application strategies and the generation of scientifically substantiated performance claims, facilitating regulatory alignment and market translation. The relevance of this pipeline is amplified in urban-coastal interfaces, where reducing diffuse pollution, such as pesticide residues and nutrient runoff, is essential for protecting marine and freshwater ecosystems, supporting biodiversity, and safeguarding public health. In parallel, the valorization of marine and agro-industrial by-products as feedstocks for biologicals aligns with circular economy principles and reinforces resource efficiency. Overall, the presented R&D framework demonstrates that biostimulants and biocontrol agents constitute scalable, science-based solutions capable of supporting sustainable intensification, reducing environmental externalities, and enhancing resilience in coastal agroecosystems, thereby contributing to the EU-CONEXUS vision of smart urban coastal sustainability.

Quinoa as a model for genomics-driven breeding of climate-resilient and healthy crops

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Developing resilient and sustainable cropping systems is essential to address climate change, soil health, and food quality. Our research uses quinoa (*Chenopodium quinoa* Willd.) as both an emerging crop for Europe and a model species to understand the genetic and molecular basis of stress resilience and nutritional quality.

We investigate key abiotic stresses (heat, drought, and flooding) and major diseases, including downy mildew and *Sclerotinia*, alongside quality traits such as protein and saponin content. By combining genome-wide association studies (GWAS), QTL mapping, and transcriptome analyses, we identify genomic regions and candidate genes underlying these complex traits. Quinoa's high genetic diversity and adaptability make it a powerful model for dissecting plant responses to multiple stresses and translating this knowledge to other crops.

These insights are directly integrated into an active breeding program that develops and selects improved quinoa lines adapted to European environments. This contributes to crop diversification, reduced input requirements through genetic resistance, and the production of nutritionally valuable food.

By linking fundamental genomics with applied breeding, our work advances sustainable disease management, enhances food quality, and supports resilient agri-food systems. It further contributes to innovation and knowledge transfer by engaging breeders, farmers, and stakeholders, positioning quinoa as both a practical crop and a model for future climate-adapted agriculture.

Blue Biomass for Sustainable Packaging: Biobased Films from Microalgal Whole Biomass and Exopolysaccharides

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The growing demand for sustainable food packaging materials has intensified the investigation for renewable resources within the emerging blue bioeconomy. Among these, marine microalgae represent a promising resource due to their rapid growth, minimal land requirements, and diverse biochemical composition.

In this study, biodegradable films were developed using whole biomass from two microalgal species and exopolysaccharides (EPS) produced by *Porphyridium purpureum*, to evaluate their potential as marine-derived materials for food-contact applications. Commercial biomass of *Arthrospira platensis* and *P. purpureum* biomass obtained from fresh cultures, subsequently harvested, washed, and freeze-dried prior to use. EPS were recovered from the culture supernatant via cold ethanol precipitation and subsequently oven-dried. Film-forming solutions were prepared by hydrating the respective powders under controlled temperature and continuous stirring, followed by the addition of a plasticizer. The resulting mixtures were cast onto Petri dishes and dried at 40 °C for 15 h. Films were then conditioned in a saturated sodium bromide environment (58% RH) prior to analysis.The developed materials were subjected to physicochemical and functional characterization, revealing promising properties. As a representative example, the *A. platensis* film exhibited adequate water barrier behaviour while remaining hydrophilic (contact angle < 90°), with low water content (17.25 ± 2.20%) and moderate water solubility (48.59 ± 3.11%). Minor antimicrobial activity was observed using the disc diffusion assay.

This study highlights the potential of ocean-derived biomass for the development of biodegradable packaging materials.

Acknowledgments

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From Farm to Fork: A Situation Analysis of the Environmental and Health Co-Benefits of Reducing Food Waste and Shifting Diets

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The presentation synthesizes evidence on how reducing food waste alongside shifting toward more plant-forward diets can yield substantial environmental and public health gains. Globally, about one third of food produced for human consumption – around 1.3 billion tonnes per year – is lost or wasted, causing extensive greenhouse gas (GHG) emissions, land use, and water consumption across the food supply chain (Schanes et al., 2018; Zhu et al., 2023; Rai et al., 2025). Food loss and waste are responsible for roughly 8–10% of global GHG emissions and a substantial share of agricultural water and cropland use (Osei-Owusu et al., 2023; Rai et al., 2025). Households are consistently identified as the largest single source of food waste, accounting for around 50–60% of total food waste in the EU and similar shares globally (Schanes et al., 2018; Aloysius et al., 2023; Wolniak & Grebski, 2025). Per capita household waste is high across income groups, driven by over-purchasing, poor planning, confusion over date labels, and suboptimal leftover management (Aloysius et al., 2023; Wolniak & Grebski, 2025). In Europe and Eastern Europe in particular, rising food demand, limited awareness, and insufficiently tailored policies amplify the environmental and economic impacts of household waste and threaten progress toward Sustainable Development Goal 12.3 and EU Green Deal targets, where the goal is to “halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses” by 2030 (Osei-Owusu et al., 2023; Wolniak & Grebski, 2025; Grīnberga-Zālīte & Zvirbule, 2022).

Dietary patterns strongly influence the environmental impacts of food systems, particularly with respect to GHG emissions and water use. Reducing the intake of high-impact animal-based products can substantially lower GHG emissions and land and water use. Food science research is essential for developing nutritionally balanced, palatable, and environmentally efficient plant-based foods, addressing challenges related to protein quality, micronutrient bioavailability, and processing intensity for long-term sustainability of plant-forward diets. Modeling studies consistently indicate that combined dietary shifts and food waste reduction can significantly decrease the carbon and water footprints of food consumption (Grummon et. al., 2023). These environmental benefits are often accompanied by positive public health outcomes, highlighting the potential for co-benefits across sustainability and nutrition objectives.

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Healthy food production on Croatian islands – potentials, threats and challenges

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For centuries, islands functioned as relatively isolated and self-sufficient systems, where the survival of local populations depended on agriculture and fishing. However, the development of maritime transport, improved connectivity with the mainland, and broader socio-economic transformations have significantly reshaped island spaces. These changes have influenced the structure of island communities and encouraged the adoption of mainland cultural patterns, including those related to food production and consumption. Although islands are still widely perceived as rural areas and repositories of authentic, locally produced food reflecting a traditional Mediterranean lifestyle, such perceptions often contrast with contemporary realities. Primary economic activities have largely declined, many settlements have undergone depopulation and ageing, and agricultural land has increasingly been abandoned. The more vital islands today are predominantly oriented towards service-based economies, particularly tourism, while only a limited number of households remain engaged in agriculture and fishing, mainly for local markets.

In recent decades, the concept of sustainability has become central to island development, emphasizing the need to balance economic growth, environmental protection, and social well-being. In this context, sustainable tourism is often promoted as a key development pathway, with local food production playing an important role in linking agriculture, cultural heritage, and tourism demand. The valorisation of traditional and locally produced food can contribute to the diversification of island economies, strengthen local identity, and support more sustainable development models. However, the growing dependence on tourism also introduces new pressures, including seasonality, land-use changes, and increased demand that may exceed local production capacities.

This research provides a comprehensive overview of the spatial and temporal processes that have shaped food production on Croatian islands over the past century. It further identifies and analyses the key contemporary drivers influencing agricultural development. Particular attention is given to both potentials and constraints, including ongoing deagrarianization, economic restructuring, unresolved property-legal relations, fragmented land ownership, and pronounced demographic challenges such as depopulation and population ageing. These factors collectively define the opportunities and limitations for developing sustainable and resilient food systems on Croatian islands.

Keywords: healthy food production, Croatian islands, sustainable development

Short Talks Abstracts / Session 2

Isolation, characterization and *in vitro* adaptive evolution of biodegrading environmental bacteria of poly(3-hydroxybutyrate) for recycling purposes

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Major environmental issues, including marine food chain, caused by the excessive use of petroleum-derived plastics in modern societies have led to the need of new alternatives. It is estimated that 80% of marine plastics derive from terrestrial wastes. Replacing microplastics that end up in marine ecosystems with biobased and biodegradable plastics could prove pivotal for lowering the impact of microplastics on the food web. This substitution could take place using green biological/chemical recycling strategies of biopolymers. Polyhydroxyalkanoates (PHAs) is a group of biodegradable polyesters with similar properties to conventional plastic, with poly(3-hydroxybutyrate) (PHB) being the most extensively studied. Here we explore different strategies for efficient post-consumer biodegradation of PHB for recycling purposes. We isolated from contaminated soil samples a large collection of biodegrading bacteria, have been characterized, both microbiologically and molecularly, as PHB degraders. We also used *in vitro* adaptation strategies to enhance the biodegradation capacity of the most efficient eaters. Crude enzyme consortia were evaluated for optimal *in vitro* PHB hydrolysis. The monomers and/or oligomers from PHB hydrolysis were evaluated as carbon sources for bacterial growth and PHB accumulation by *Pseudomonas alloputida*. This work underlines the need of research in unexplored poly(3-hydroxybutyrate)-degrading bacteria and green technologies for recycling biogenic monomers.

Keywords: poly(3-hydroxybutyrate), environmental microbiology, marine protection, upcycling, microbial fermentation

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Development of IMTA in the Adriatic Sea – a path to more ecologically and economically sustainable aquaculture practices

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During the last decades numerous studies have demonstrated the economical, ecological and social benefits of Integrated Multi-trophic Aquaculture (IMTA). The majority of these studies were targeted towards integration of finfish (salmon) with extractive organisms (bivalves) and seaweed. However, in the oligotrophic Mediterranean, and especially in the Adriatic Sea, research related to the potential of the IMTA as a reasonable solution in quest for sustainable aquaculture is relatively limited. Moreover, commercial application in the open sea cage farming aquaculture industry so far very rare or on the small scale. The most of the Mediterranean and its most northern part – the Adriatic Sea is too oligotrophic to support the commercial aquaculture of bivalves at the open sea. Therefore, most of the bivalve production is settled in areas close to the freshwater inputs, such as river estuaries, lagoons and other more eutrophic sites. These sites are relatively small and with increasing problem of conflict with other users (such as tourism, pollution and maritime traffic). IMTA in the oligotrophic environment seems as a logic alternative for an increase of bivalve aquaculture, especially mussel as one of the most consumed species on the EU market. Positive effects of cage fish farming on the production performance of mussels are documented in the Adriatic Sea by: Peharda et al. (2007), Zupan et al. (2012), Zupan et al. (2014), and Gvozdenovic et al. (2018). Recently, positive interactions with holothurians (Zupan et a. 2023) and sponges (Skapul et al. 2024) were reported. Research on cultivation of macroalgae is scarce, but should be investigated in the near future. In the recent years, while the climate changes pose significant threat to the industry, the potential of the IMTA commercial application seems like a logical pathway in near future. However, legislative and technical challenges still inhibit the commercial scale up and transfer from the monoculture to integrated aquaculture systems. Species diversification and potential for integration still needs more research focus. In this review research related to the Adriatic aquaculture, we cover the gained knowledge and practices, providing overview of the current status and potential for the incorporation of IMTA principles in the commercial production. Overall goal is to promote the sustainable development of the aquaculture industry.

Modelling eutrophication dynamics for sustainable coastal management: application of the EUTROPY model in the Curonian Lagoon

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Eutrophication, driven by excessive nutrient inputs, remains a major threat to coastal and transitional water ecosystems, affecting biodiversity, water quality, and the resilience of socio-ecological systems. In environments such as the Curonian Lagoon, these pressures are exacerbated by land-based pollution and climate change, underscoring the need for integrated, science-based approaches to sustainable coastal water management.

This study presents the EUTROPY model, an open-access numerical ecological model developed to simulate nutrient dynamics and phytoplankton growth in coastal lagoon systems. The model is designed to balance ecological complexity with computational efficiency, enabling its application as a practical decision-support tool for environmental assessment and management. Through the implementation of Just-In-Time (JIT) compilation, the model achieves enhanced computational performance, allowing for efficient simulation and scenario analysis.

Model evaluation against observed data demonstrates that EUTROPY effectively captures key eutrophication dynamics, particularly seasonal variations in nutrient concentrations and phytoplankton biomass. Comparisons of simulated and observed chlorophyll-a concentrations indicate that the model reliably reproduces general seasonal trends, although short-term variability remains challenging to resolve due to complex nutrient interactions and data limitations. Statistical performance shows moderate agreement in dynamic regions, while stronger correlations are achieved for total nitrogen, supporting the model's capacity to represent large-scale nutrient processes.

The application of EUTROPY provides valuable insights into nutrient transport processes, including fluxes from the Curonian Lagoon to the Baltic Sea, thereby informing strategies to reduce land-based pollution and mitigate downstream impacts. As an open-access tool, the model promotes transparency and accessibility, facilitating its integration into broader environmental governance frameworks and supporting collaborative, science-based decision-making.

By linking advanced ecological modelling with sustainable coastal management objectives, this work contributes to ongoing socio-ecological transitions. The EUTROPY model supports improved ecosystem health assessment, enables scenario-based evaluation of management measures, and complements emerging monitoring approaches such as remote sensing and data-driven environmental analysis. Overall, it offers a robust framework for enhancing the protection and resilience of coastal and marine ecosystems under increasing anthropogenic and climate pressures.

UAV multispectral and hyperspectral-informed monitoring of invasive coastal vegetation in Ireland for policy-driven coastal management

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Unmanned Aerial Vehicles (UAVs) provide a flexible, high-resolution platform for monitoring complex coastal ecosystems. In Ireland, invasive species such as Sargassum muticum, Hippophae rhamnoides, and Spartina anglica pose significant threats.
Vegetation was spectrally sampled (400–2500 nm) across coastal environments to develop a spectral reference library. UAV surveys were conducted using a multispectral platform with RTK-enabled georeferencing, with flight altitudes between 30–120 m achieving ground sampling distances of approximately 1–5 cm, depending on sensor band and optical configuration.

Pre-processing included radiometric calibration, reflectance normalisation, and orthomosaic generation, followed by classification using Support Vector Machines and Random Forest algorithms. The workflow enables repeatable monitoring at site scales, covering approximately 10–40 hectares per day.

This work supports EU policy frameworks and contributes to SAC and SPA monitoring, while supporting blue carbon ecosystem assessment.

Machine learning from stakeholder knowledge for social-ecological systems modelling

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Social-Ecological Systems (SES) frameworks are crucial for understanding marine ecosystem services, but their development is cognitively demanding, typically requiring extensive expert effort. Within the HORIZON EUROPE MarineSABRES project, structured interviews with over 150 stakeholders and researchers across Europe generated an extensive participatory knowledge base. This resulted in social-ecological models for three demonstration regions—Macaronesia, the Arctic, and the Mediterranean—covering seven insular systems and diverse management contexts, including fisheries, eutrophication, marine protected areas, and climate adaptation. The SES approach implemented the DAPSI(W)R(M) problem structuring method, which provides the sequential framework: Drivers → Activities → Pressures → MPF/C → Ecosystem Services → Goods and Benefits → Responses as Measures, with explicit feedback loops from Responses back to Drivers, Activities, and Pressures. Building on this rich, expert-validated knowledge base, we developed a novel AI-enhanced decision support system that learns from stakeholder consensus and participatory modelling processes. Eight complementary machine learning approaches were implemented using over 200 validated causal connections and 78 unique SES elements. These include deep learning for connection prediction, graph neural networks for model completion, transfer learning for template matching, BERT-based NLP for SES element extraction, reinforcement learning for response optimization, ensemble feedback detection, and collaborative filtering for recommendations. The system is integrated into the MarineSABRES SES Toolbox via R Shiny. Results show substantial efficiency gains: non-experts can now generate scientifically robust SES models, identifying more relevant connections and achieving greater consistency across users. This marks a shift from static expert-driven frameworks to dynamic, AI-supported participatory systems for scalable marine policy and management.

From damage to restoration: civil liability, full reparation and coastal ecosystem governance under EU law

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Coastal and marine ecosystems face mounting pressures from industrial pollution, unsustainable resource use and climate change. This paper argues that the proliferation of public law responses — European, administrative and legislative — has systematically failed to provide adequate remedies for ecological damage to these environments, and that civil private liability law, centred on Article 1240 of the Civil Code and the principle of full reparation as its foundational expression, offers a more coherent and victim-centred alternative.

Under Article 1240, any fault causing damage obliges its author to repair it — its corollary, the principle of full reparation, mandating integral compensation of all loss. The codification of ecological damage (Articles 1246–1252, Biodiversity Act of 8 August 2016) extends this framework to collective harm transcending personal interests: the *préjudice écologique* under Article 1247 constitutes a true collective damage — an impairment to ecosystems, including coastal and marine environments, valued independently of individual repercussion. Structural challenges persist: diffuse causation, large-scale contamination and partial irreversibility. The PFAS crisis illustrates this acutely — persistent pollutants contaminating river systems and coastal waters alike — yet the French PFAS Act of 27 February 2025 deliberately avoided establishing a specific civil liability regime, confirming that Article 1240 remains the primary, though structurally strained, avenue.

The inadequacy of public law is threefold. The EU Nature Restoration Regulation (No. 2024/1991, August 2024) binds Member States to restore degraded coastal and marine ecosystems — including seagrass beds and salt marshes — yet grants no private right of action to victims. Administrative access to justice is being further eroded by a draft "simplification" decree on environmental litigation that would suppress a level of judicial review. Most critically, the State occupies a structurally conflicted position: simultaneously entitled to bring actions for ecological damage (Article 1248 Civil Code) and to receive compensation for environmental remediation (Article 1249), yet holding participations in polluting industries and itself condemned for inaction (Tribunal administratif de Paris, 2023). The Calanques coastal ecosystem case further highlights unresolved challenges of ecosystem valuation.

The TotalEnergies case (Paris Judicial Court, judgment expected June 2026) illustrates civil private law's potential: plaintiffs articulate the duty of vigilance (Law of 27 March 2017) with the prevention of ecological damage under Article 1246, combining preventive and reparatory mechanisms in a coastal climate context for the first time.

Drawing on these developments, this paper advocates for a reformed civil liability framework specifically addressing coastal ecological harm. Central to this proposal is

a dedicated ecological damage reparation fund — financed through corporate sanctions and vigilance penalties — capable of resolving the State's structural conflict of interest, ensuring independent governance of remediation resources, and delivering coherent remedies for collective coastal ecological damage.

French Civil Code, Art. 1246–1252 (Loi n° 2016-1087 du 8 août 2016). — EU Nature Restoration Regulation No. 2024/1991 of 22 June 2024. — Loi n° 2017-399 du 27 mars 2017 relative au devoir de vigilance. — Loi n° 2025-188 du 27 février 2025 (PFAS). — Cass. Crim., 25 sept. 2012, n° 10-82.938 (Erika).

Short Talks Abstracts / Session 3

Cascading events in coastal environments and their impact on critical infrastructure

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Flooding is often examined as an isolated hazard, despite the fact that it frequently emerges from interconnected and cascading environmental processes. A better understanding of these interactions is essential for advancing risk assessment methodologies and strengthening the resilience of critical infrastructure, particularly in vulnerable coastal regions.

This study presents a review of recent scholarly literature published since 2020, with a focus on the relationship between cascading environmental hazards, flood generation, and impacts on critical infrastructure. A structured search strategy was employed using combinations of terms related to cascading and compound hazards, flooding, and critical infrastructure resilience, with the aim of identifying studies that address both the underlying processes and their systemic consequences.

The review highlights multiple environmental drivers that can contribute to flood occurrence and escalation, including extreme storm events, landslides, and prolonged dry periods. Such processes may interact in ways that intensify flood magnitude, prolong flood duration, and increase the exposure and vulnerability of critical infrastructure systems.

The findings reinforce the importance of adopting a multi-hazard perspective in flood risk assessment and underline the need to explicitly account for cascading processes in the development of robust mitigation, adaptation, and resilience strategies.

Disclosure: AI-based tools were used for linguistic editing and formatting support.

Twinning ecologies: representing interdependence across more-than-human authors in a coastal landscape digital twin

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This paper examines the challenge of representing the interconnected relationships between authors and actors of a landscape within an Irish coastal landscape digital twin (CLDT). Using the Cuplá Trá project as a case study, it explores how digital twin modelling can be combined with landscape biography methodology to bridge landscape theory and digital representation. This paper is intended to be presented alongside a companion paper, entitled, *"Encoding ecologies: technical challenges of representing more-than-human authors in a coastal digital twin"*, presented by Sinéad Barnett.

Landscape biographies interpret landscapes as layered historical narratives shaped by successive actors and processes and are often used to synthesise environmental and cultural knowledge for spatial design and planning, especially in the Netherlands. The Cuplá Trá project builds on this approach through the creation of a landscape digital twin of an extensive dune system and intertidal lagoon in southeast Ireland. While landscape biographies typically foreground human authors of landscape change, this project shifts attention toward ecological actors that shape and maintain this unique coastal environment. Drawing conceptually on deep ecology (Naess, 2005), the research emphasises interdependence among organisms within this ecosystem. It asks how these *relationships*, typically represented in two-dimensional formats such as a food pyramid, might be visualised within an interactive four-dimensional digital twin model, with the inclusion of temporal changes. Largely devoid of permanent human occupation, the research site is shaped and maintained through ecological interactions between key species and geomorphological forces. The project identifies a select set of flora and fauna that are critical to the formation and persistence of this unique coastal system, partly defined by Nature 2000 codes. Thus, the primary challenges concern both selection (what to include or exclude) and representation: how to meaningfully visualise these authors, their interrelationships, and their interactions with the landscape within the digital twin, while also working across diverse disciplinary perspectives and forms of expertise. By engaging these challenges, the Cúpla Trá proposes new methods for representing ecological authorship in digital landscape models and suggests where digital twins may support more ecologically grounded understandings of coastal landscapes.

Encoding Ecologies: Technical Challenges of Representing More-than-Human Authors in a Coastal Digital Twin

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Building on the framework of *"Twinning ecologies: representing interdependence across more-than-human authors in a coastal landscape digital twin,"* presented by Emily Kim, this paper explores how ecological relationships can be translated into an interactive coastal landscape digital twin (CLDT) developed in the game engine, Unity. While landscape biography understands landscapes as layered narratives shaped by human and ecological actors, turning these relationships into an interactable digital assets requires simplification and careful decision-making.

Using the Cúpla Trá project as an example of an extensive dune system and intertidal lagoon based in Waterford Ireland, this paper focuses on how ecological elements, such as species, habitats, and coastal processes, are selected, organised, and represented within the CLDT. It explores how different types of data, including local knowledge and scientific measurements (e.g., GIS maps, shape layers, json files, reports, etc.) from a variety of government and private agencies, such as, the Environmental Protection Agency (EPA), National Parks and Wildlife Service (NPWS), Biodiversity Ireland, etc, are prioritised and translated into the CLDT.

The CLDT allows users to explore the landscape, toggle between data layers, and experience "what if" scenarios; sea level rise, wind erosion and wild fires. This creates new ways of understanding ecological systems and support learning and experimentation. However, this requires simplifying these complex relationships so they can function smoothly in within the CLDT in real time. Processes like climate change, sea level rise, erosion, and species interactions are turned into interactive features that are both informative and easy to engage with. Real-world complexity and technical limits such as measuring human footfall, animal interactions and the use of data sensors on public land are explored further. Coastal environments are constantly changing, while typical digital twins depend on fixed rules and performance constraints. This creates a new challenge on how to gather and implement this live data into the CLDT. As a result, some ecological knowledge must be reduced, generalised, or left out and shapes how users can interpret the landscape. By making these technical and design choices more visible, the Cúpla Trá CLDT supports a clearer, more transparent and meaningful digital representation of coastal landscapes and actively shapes how coastal environments are understood.

GNSS-based ionospheric monitoring of tsunami-induced disturbances as a potential early warning tool

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Coastal regions are highly vulnerable to tsunami hazards, requiring enhanced monitoring beyond conventional seismic and ocean-based systems, which remain spatially limited and lack upper-atmosphere sensing. Global Navigation Satellite System (GNSS)-based ionospheric observations provide a complementary remote sensing approach by detecting tsunami-induced perturbations at ionospheric altitudes. Tsunamigenic earthquakes induce strong lithosphere–ocean–atmosphere–ionosphere coupling through atmospheric acoustic–gravity waves (AGWs), which propagate upward and perturb ionospheric plasma densities, producing measurable variations in Total Electron Content (TEC). As these waves reach ionospheric heights (~250–400 km), their amplitudes grow due to decreasing atmospheric density, enabling detection of small sea-surface displacements as TEC perturbations (~0.5–1 TECU). These disturbances, known as co-tsunamic travelling ionospheric disturbances (CTIDs), preserve key tsunami characteristics, including phase velocities (~150–300 m/s), dominant periods (~10–30 min), and propagation directions consistent with ocean wavefronts. Faster ahead-of-tsunami ionospheric disturbances (ATIDs), propagating at acoustic speeds (~600–1400 m/s), further indicate rapid atmospheric coupling associated with the leading tsunami front. GNSS-TEC observations from three major tsunami events—the 2004 Indian Ocean (Sumatra) tsunami, the 2011 Tohoku tsunami, and the 2025 Kamchatka tsunami—demonstrate consistent ionospheric responses across diverse geophysical conditions. Multi-station analyses reveal coherent near- and far-field TEC perturbations, with hodochrone patterns matching tsunami travel times and, in some cases, exhibiting dispersive propagation influenced by bathymetry. Basin-scale observations confirm that ionospheric signatures can be detected thousands of kilometres from the source, highlighting the capability of dense, multi-constellation GNSS networks to provide continuous, wide-area monitoring, including regions with sparse ocean instrumentation. The repeatability of these signatures confirms robust tsunami–ionosphere coupling and establishes GNSS-derived TEC as a reliable high spatio-temporal resolution remote sensing tool. In the context of disaster preparedness and risk management, GNSS-based ionospheric monitoring provides a complementary and infrastructure-independent observational layer for tracking tsunami propagation and supporting early warning systems, enabling improved situational awareness and informed decision-making for timely precautionary actions in vulnerable coastal regions.

Meteotsunami-Driven Saline Intrusions in the Curonian Lagoon

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Meteotsunamis are atmospherically generated long-period waves that can become hazardous in coastal and harbor environments due to resonant amplification. Beyond their impact on navigation and port operations, they may also affect water exchange and salinity dynamics in semi-enclosed coastal basins. Using the Curonian Lagoon as a case study, this work investigates the relationship between meteotsunami-favorable atmospheric conditions, resonant long-wave responses, and saline water intrusions through the Klaipėda Strait. Meteorological conditions favorable for meteotsunami generation were identified from rapid atmospheric pressure changes and synoptic indicators. Saline water intrusions were assessed using salinity observations and hydrodynamic model output, while spectral analysis of sea-level data was used to identify long-wave bands and resonant periods that can amplify meteotsunami oscillations. The results show that approximately 40% of saline water intrusion events coincided with meteorological conditions favorable for meteotsunami generation. These conditions were more often associated with inflow of Baltic Sea water into the lagoon than with outflow from it, suggesting that meteotsunami-related forcing may enhance exchange through narrow straits and promote saline water intrusion into low-salinity lagoon environments. The findings indicate that meteotsunamis should be considered not only as a marine hazard, but also as a process relevant to salinity variability, ecosystem functioning, and the resilience of coastal lagoon systems. This underscores the need for integrated monitoring and forecasting approaches that combine atmospheric observations, sea-level spectral analysis, and high-resolution hydrodynamic modeling to support early warning of coastal hazards, climate adaptation, and resilience planning in vulnerable lagoon and port systems.

Advanced wind and seismic resilience- targeted evaluation of civil infrastructure at city- scale level

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A worldwide database of consequences from natural hazards-induced damage to civil infrastructure reveals a tremendous amount of reported losses (United Nations Office for Disasters Risk Reduction-UNISDR https://www.undrr.org/). Performance-Based Structural Engineering (PBSE) is rapidly evolving from a conceptual framework into a practical advanced methodology capable of quantifying the wind and seismic structural performance in terms of damage, loss, and resilience, supported by Probabilistic Wind Hazard Analysis (PWHA) and Probabilistic Seismic Hazard Analysis (PSHA) advanced approaches, as well as efficient nonlinear time- domain analysis computational algorithms. These largely open the doors for straightforward damage, loss, risk, and resilience level estimates at city-scale levels (Iancovici and Nica, 2023).

The paper presents an advanced consequence- based analysis workflow, to estimate the structural damage of buildings exposed to synoptic and non-synoptic extreme winds, and strong earthquakes, by coupling (i) site-relevant wind and seismic hazard representation, (ii) time histories of aerodynamic loads from wind tunnel measurements and strong input ground motions time-series based on PSHA- targeted scenarios, (iii) fast nonlinear dynamic response analysis, and (iv) downstream damage, fragility, and loss-estimation end- products.

Input ground motion time- histories associated with PSHA- targeted scenarios are obtained using both time- and frequency-domain simulation techniques (Al Atik and Abrahamson, 2010; Boore, 2003). Structural loss assessment is performed at individual and city-scale level, for 1000 buildings virtual portfolio in Bucharest, grouped in three structural typologies- Low Code (LC), Moderate Code (MC), and High Code (HC) design requirements. Repair consequences are computed using HAZUS-type damage-to-loss mapping to obtain conditional expected damage ranks and repair costs as functions of typical intensity measures (IM) used in Wind and Earthquake Engineering practices. Nonlinear time-domain analysis provides a transparent bridge between hazard intensity measure, structural damage evolution, and loss metrics, supporting resilience-targeted evaluation well beyond conventional prescriptive design checks. The workflow is readily extensible towards large civil infrastructure and database-assisted digital environments for BIM-enabled PBSE implementation.

Acknowledgments

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Posters
Session 1

Good Food, Good Feelings: Exploring Body Image and the Mediterranean Diet

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Body image satisfaction, which includes acceptance, respect, and a positive evaluation of one's own body, is closely linked to health-related behaviours, including dietary habits. Previous research indicates that higher body satisfaction is associated with healthier eating patterns, while body dissatisfaction is related to poorer diet quality. The Mediterranean diet, characterised by high consumption of fruit, vegetables, whole grains, olive oil, and moderate intake of fish and dairy, has been extensively associated with physical and psychological health benefits.

This study examined the relationship between body image satisfaction and adherence to the Mediterranean diet among young women in Croatia. One hundred female participants (58% students, 42% non-students; mean age = 24 years) completed an online survey including the Body-Esteem Scale for Adolescents and Adults (BESAA), the Mediterranean Diet Adherence Screener (MEDAS), and the Mediterranean Diet Serving Score (MDSS).

Results showed a low but statistically significant positive correlation between body image satisfaction and the Mediterranean Diet Serving Score, indicating that women who more frequently consumed foods typical of the Mediterranean diet reported higher body satisfaction. However, no significant association was found between body image satisfaction and self-reported adherence to the Mediterranean diet as measured by MEDAS.

These findings suggest that concrete dietary behaviours may be more closely related to body image satisfaction than subjective perceptions of dietary adherence. The study highlights the complexity of the relationship between body image and eating habits and underscores the need for further research using diverse measurement approaches and larger, more representative samples.

Key words: body image satisfaction, Mediterranean diet, young women, dietary habits

Consumer Perceptions of Insect-Based Food: From Topic Modeling of Associations to Consumption Intentions

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Insect-based food represents a nutritious alternative to traditional food; however, its adoption remains low, especially in Croatia. The aim of the study was to gain a deeper understanding of consumer perception of insect-based food and to relate it to consumer behavior. Data were collected from a convenience sample of Croatian participants. Participants provided up to five associations related to insect-based food, and the final sample included 530 participants (M_{age} = 37.61, *SD* = 16.01, n_{female} = 295) who provided more than one word as an association.

To extract topics, we used the natural language processing library BERTopic, which utilizes transformer-based models to capture semantic meaning. Associations were translated into English and aggregated at the participant level into a single text input. Model parameters were defined using Bayesian hyperparameter search, considering model interpretability and stability. Extracted topics cover affective domain, perceived contamination risk, insect association, sensory perception, cultural perception, and socioeconomic perception. The affective domain includes *squeamishness nausea disgust*, *disgusting ugly distasteful*, *slimy disgusting horror*, and *slimy ugly distasteful*. Perceived contamination risk is represented by bacteria covid parasites, insect association by *cockroaches bugs locusts*. Sensory perception includes *crunchy nutritional crispness* and *taste acidity bitterness*, while cultural perception is represented by *Asia China Chinese* and *exotic tempting unusual*. Socioeconomic perception is described by *poverty hunger misery*.

On the subsample of participants who reported never having eaten insects (*N* = 472), Spearman correlations were calculated between the probability of associations belonging to each topic and intention to consume insects (1 – no: *n* = 318, 2 – maybe/yes in some specific form: *n* = 149). Negative relations with consumption intention were found for *squeamishness nausea disgust* (ρ = -.18, 95% CI [-0.27, -0.09]), *disgusting ugly distasteful* (ρ = -.14, 95% CI [-0.22, -0.05]), *slimy disgusting horror* (ρ = -.19, 95% CI [-0.28, -0.11]), *slimy ugly distasteful* (ρ = -.19, 95% CI [-0.28, -0.10]), and *bacteria covid parasites* (ρ = -.11, 95%CI -0.19, -0.02]). Positive relations were found for *crunchy nutritional crispness* (ρ = .29, 95% CI [0.21, 0.37]), *taste acidity bitterness* (ρ = .14, 95% CI [0.05, 0.23]), *Asia China Chinese* (ρ = .13, 95% CI [0.04, 0.22]), and exotic tempting unusual (ρ = .28, 95% CI [0.20, 0.37]). *Cockroaches bugs, locusts* and *poverty hunger misery* were not significantly related to consumption intention.

Results show that natural language processing methods can identify distinct aspects of consumer perception and their systematic relationships with consumption intentions.

Transforming food supply routines through digital access: analysis of the role of the smartphone in changing practices

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Objective: The aim is to examine consumer practices and food supply routines. Food systems represent a major challenge for sustainability transitions, as more than one third of global greenhouse gas emissions are attributable to human activities related to food. This makes food consumption and provisioning practices a key area for transformation. At the same time, the increasing digitalisation of everyday life is reshaping food provisioning systems, leading to the emergence of new modes of supply. However, for these new modes of provisioning to become routinised, it is essential to first understand existing food supply routines and how digital tools—particularly smartphones—become embedded within them.

Method: This work is based on a systematic literature review (SLR). A search was conducted using the keywords “routine”, “routine AND shopping”, “habits AND smartphone”, “food AND routine”, and “routine AND grocery” in the Scopus database. In addition, the study relies on the analysis of 39 semi-structured interviews conducted with consumers from producer-based retail outlets, with diverse profiles, in order to gain an in-depth understanding of food provisioning routines.

Results: This research shows that food provisioning routines are not solely the result of rational individual choices. Drawing on social practice theory, routines can be understood as a configuration of practices that are negotiated and organised around three main dimensions: temporal, spatial, and social (T. Agrawal et al., 2018; Aidi et al., 2015; Cannuscio et al., 2014; Dyen et al., 2018; Schuler et al., 2024). In this context, the portability of smartphones facilitates their integration into everyday routines. Smartphones contribute to structuring the temporality of routines, while supporting and enabling adaptation strategies related to shopping practices, particularly in the context of producer-based retail. Their visual interfaces, instant access to information, and time-management functionalities can influence food purchasing practices, with differentiated effects depending on consumer profiles.

Conclusion: By understanding food provisioning routines through their spatial, temporal, and social dimensions, it becomes possible to rethink the dynamics of food accessibility. This research highlights that food provisioning routines can be transformed in two main ways: first, progressively, through a reflexive and gradual acceptance of new food products and practices; and second, more abruptly, through the transformation of one of the three core dimensions of the routine. Regarding the role of digitalisation, our findings confirm that smartphones contribute to configuring the temporality of routines, while also acting as facilitators of routine adaptation strategies. In this sense, smartphones not only support existing practices but also enable adjustments in how individuals organize their food provisioning activities. However, further research is needed to better understand how smartphones can be integrated into the progressive transformation of routines, particularly in the context of sustainability transitions.

Dietary TMAO-induced inflammation produces changes in social behavior.

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Social behavior is sensitive to increasing inflammatory signals in the central and peripheral nervous system. When the sources of this inflammation involve metabolic variables, they are most often related to obesity where multisystemic action prevents determining the relevance of the factors individually. Yet it is still unknown if metabolic variables associated with a diet unbalanced by an excess of animal-based foods could change social behavior without changing body weight. Here, using a dietary source to raise the brain levels of TMAO (Trimethylamine N-oxide, a gut bacteria metabolite increased in diets with high animal source food) with no weight variation, we characterize behavioral, neurogenic and physiological changes. First, we showed that dietary TMAO reaches the mouse brain and is distributed heterogeneously in structures that control social behavior and female mice have higher levels than males, despite a reduced intake, suggesting a more efficient TMA into TMAO conversion or a more permeable blood brain barrier. We evidenced that social novelty and social interaction was reduced in the presence of high dietary TMAO. Under these circumstances, we reported higher levels of TNFα, IL-6, IFN-ɣ and IL1β in different social behavior controlling areas and altered neurogenesis in the subventricular zone with functional olfactory consequences. Finally, we counteracted most of the behavioral and inflammatory effect of TMAO with the TMA-lyase inhibitor iodomethylcholine. All together our results indicated a crucial role of the dietary metabolite TMAO in inflammatory modulation of social behaviors.

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Brain Resilience: Open-Skill vs. Closed-Skill Exercise in Mild Cognitive Impairment Treatment

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Background. Physical exercise is a widely recommended strategy to delay Mild Cognitive Impairment (MCI) and prevent Alzheimer's disease. However, the specific neurological benefits of different movement paradigms remain underexplored. Traditional approaches often treat all physical activity equally, overlooking the profound differences in brain activation between predictable, repetitive movements (closed-skill) and dynamic, unpredictable environments requiring continuous cognitive-motor adaptation (open-skill).

Objective. This study investigates the differential impact of open-skill versus closed-skill exercise on brain resilience in older adults with MCI. We aim to determine how the cognitive demands of movement influence neuroplasticity, pathological progression, and cognitive function, while exploring the moderating effect of the APOE4 genetic risk factor.

Methods. In this comparative study, participants with MCI are assigned to either an open-skill or a closed-skill exercise program. To accurately capture the subtle functional shifts that traditional paper-and-pencil tests miss, cognitive trajectories are evaluated using digital phenotyping. Specifically, the Digital Clock and Recall (DCR)—incorporating the DCTclock, digital Trail Making Test (dTMT), and Digital Animal Coding (DAC)—is utilized to extract high-resolution kinematic metrics of executive function, information processing, and motor planning. Concurrently, blood biomarkers are analyzed to track biological changes: Brain-Derived Neurotrophic Factor (BDNF) serves as a proxy for exercise-induced neuroplasticity, while ptau217 is measured to monitor Alzheimer's-specific pathological burden.

Anticipated Outcomes. We hypothesize that open-skill exercise, due to its inherent demands for proactive control, conflict resolution, and environmental monitoring, will trigger a superior neuroplastic response (upregulated BDNF) compared to closed-skill modalities. Furthermore, this cognitively demanding physical intervention is expected to better stabilize ptau217 levels and preserve executive function as measured by DCR kinematics.

Multicomponent exercise training to prevent cognitive decline in older adults with mild cognitive impairment

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Mild cognitive impairment (MCI) is a transitional stage between normal aging and dementia, characterized by cognitive decline beyond what is expected for age without significant loss of functional independence. Its prevalence is increasing globally, representing a major public health challenge. Early intervention strategies are essential to delay or prevent progression to dementia.

Physical exercise has emerged as a promising non-pharmacological approach due to its positive effects on brain health, including improved neuroplasticity, reduced inflammation, and enhanced metabolic regulation. In particular, multicomponent training programs combining aerobic exercise, strength, and cognitive tasks may provide greater benefits by targeting multiple physiological and cognitive pathways. The present study aims to evaluate the effects of a multicomponent exercise intervention on cognitive function, well-being, and health-related habits in older adults with MCI. A randomized controlled trial will be conducted with 60 participants divided into an experimental group and a control group over a six-month period. Cognitive performance will be assessed using the Digital Clock and Recall test, while well-being and health perception will be measured through validated questionnaires such as the General Health Questionnaire and WHO-5 Well-Being Index.

It is hypothesized that the intervention will improve global cognitive function, emotional well-being, and lifestyle habits compared to the control group. Additionally, qualitative analysis will explore participants' experiences and perceived barriers. This study may contribute to the development of effective, accessible interventions to promote healthy cognitive aging.

From Sensing to Healing: A Real-Time Biofeedback System for Mental Health Management in Older Adults

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Background: The World Health Organisation defines 60 years as the onset of old age, a phase characterised by progressive physiological and psychological changes. In Ireland, this transition is becoming increasingly significant, with the older adult population projected to exceed 20% by 2040, effectively doubling due to declining fertility rates, increased longevity, and post-COVID-19 accelerated ageing. This demographic shift intensifies a largely silent mental health crisis, where anxiety and depression are both highly prevalent among older adults. Often underdiagnosed or undiagnosed, due to a global shortage of mental health professionals, limited accessibility to care, social stigma, resource constrains or overlapping symptoms with other age-related conditions. The consequences are substantial, leading to diminished quality of life, accelerated physical decline, a catalyst for other ailments leading to increased comorbidities, and, ultimately, premature loss of healthy life years.

Objective: The research focuses on developing a simple, non-invasive system that continuously monitors markers of anxiety and depression in older adults using a low-complexity wearable sensor. Automating the use of personalised music as an adaptive therapy intervention, thereby reducing the dependence on common pharmacological treatments (sedatives). Hence, overcoming the accessibility and scalability limitations of traditional, therapist-dependent and clinical supervision care models.

Method: The proposed architecture integrates three core components: 1) A body-area-sensor network employing a non-invasive photoplethysmography PPG sensor for real-time, comfortable monitoring of physiological markers of anxiety and depression. 2) A cloud-based computational framework performing data acquisition, signal processing, and machine learning based classification to identify mental health states and enabling adaptive decision-making. 3) A user-centric delivery system for streaming personalised music playlists through a headset/earpiece, forming a closed-loop biofeedback mechanism.

Results: Personalised music intervention effectively alters neural activity, facilitating faster inhibition of the sympathetic nervous response and thereby regulating physiological parameters towards normalisation. This promotes transition from an anxious state to a calmer one, fostering improved emotional regulation and positive cognitive ideation.

Conclusion: The integration of wearable sensing, cloud intelligence, and adaptive music therapy offers a scalable, user-centric solution for proactive mental health management in older adults. By enabling continuous monitoring and autonomous intervention in a single loop. The system has the potential to reduce dependence on medication, enhance accessibility to care, and significantly improve overall mental and physical well-being.

Genetic variability in antioxidant enzymes *SOD2* and *CAT* and clinical heterogeneity of multiple sclerosis

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Multiple sclerosis (MS) is a chronic autoimmune disorder of the central nervous system characterized by inflammation, demyelination and progressive neurodegeneration. There is increasing evidence of the involvement of oxidative stress in MS pathophysiology, while genetic factors affecting antioxidant defence mechanisms may influence disease susceptibility and clinical presentation. The aim of the present study was to investigate potential association of two functional single nucleotide variants (SNVs) in antioxidant enzyme genes, namely *SOD2* rs4880 and *CAT* rs1001179, with MS susceptibility and specific clinical features in a Greek population. A total of 465 unrelated individuals were enrolled in the present case-control study, consisting of 200 clinically diagnosed MS patients and 265 neurologically healthy controls of Southeastern European origin. Genomic DNA was extracted from peripheral blood samples and the investigated SNVs were genotyped using the competitive allele-specific PCR (KASP) assay. Genotype and allele frequency distributions were compared between cases and controls, while additional analyses were conducted to explore possible associations between the studied SNVs and clinical characteristics in the MS cohort. Logistic regression models were used to adjust for potential confounding factors, and false discovery rate (FDR) correction was applied to account for multiple comparisons. No significant associations were observed between the investigated SNVs and overall MS susceptibility. However, subgroup analyses revealed potential associations with specific clinical features. In particular, the *SOD2* rs4880 variant showed a significantly higher prevalence of T-allele containing genotypes among patients with motor symptoms, an association that remained significant after adjustment for age and sex and correction for multiple testing. Additional exploratory associations were observed between *CAT* rs1001179 and clinical characteristics, including the presence of spinal cord lesions. Although these findings require confirmation in larger and independent cohorts, they suggest that genetic variability in antioxidant defence pathways may contribute to the clinical heterogeneity of MS and may provide valuable insights for new approaches for the characterization and management of the disease based on biomarkers.

L-Dopa Decarboxylase Mediates Apoptosis Through Regulation of PI3K/AKT Pathway in Response to DENV Infection

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Introduction: Dengue virus (DENV) is a mosquito-borne pathogen responsible for over 400 million infections annually and is endemic in more than 100 countries. Clinical manifestations range from mild fever to severe hemorrhagic fever and shock syndrome. The lack of effective antiviral treatments, combined with the limited efficacy of existing vaccines, highlights the need to better understand host–virus interactions. Moreover, climate change is facilitating the spread of mosquito vectors, increasing DENV transmission in previously unaffected regions. L-dopa decarboxylase (DDC), an enzyme involved in dopamine and serotonin biosynthesis, has been primarily studied in the nervous system but is also expressed in peripheral tissues, where it contributes to cellular homeostasis. Recent findings from our group identified DDC as a negative regulator of DENV replication in liver cells, potentially through its interaction with phosphatidylinositol 3-kinase (PI3K). Since DENV manipulates the PI3K/AKT pathway to promote cell survival and replication, this study aimed to investigate whether DDC modulates virus-induced apoptosis.

Materials and Methods: DDC expression was silenced in Huh7.5 cells (shDDC), control cells (shControl) were also used. Following DENV infection, cytopathic effects were assessed microscopically. Apoptosis was evaluated using Annexin V/PI staining

and TUNEL assay. The activation of caspases, BCL-2 family proteins, and TRAIL-receptor genes, was examined by RT-PCR and SDS-PAGE analysis. The mitochondrial membrane potential in DENV-infected cells was determined by flow cytometry, fluorescence and confocal microscopy. The mitochondrial ROS (mtROS) were measured using a fluorescent probe, while the localization of cytochrome c was checked using immunofluorescence. The phosphorylation levels of AKT and mTOR were determined by SDS-PAGE. Pharmacological inhibition of AKT phosphorylation was also performed. Oxygen consumption and extracellular acidification rates were analyzed using Seahorse XF Pro Extracellular Flux Analyzer.

Results: DDC silencing significantly reduced DENV infection-caused cytopathic effects. This was accompanied by suppression of early and late apoptosis in shDDC cells, along with decreased activation of caspases and BCL-2 family proteins. Analysis of the mitochondrial network showed improved integrity in infected shDDC cells, higher respiratory capacity, reduced ROS production, and decreased cytochrome c release. Additionally, DENV infection-induced reduction of phosphorylated AKT and mTOR levels was higher in control cells. Inhibition of AKT phosphorylation abolished differences in apoptosis and cell viability between the two cell lines.

Conclusion: This study highlights the suppressive role of DDC against DENV replication by modulating the PI3K/AKT-dependent apoptotic signaling. These findings provide new insight into host-directed antiviral mechanisms and reveal potential targets for therapeutic intervention in emerging infectious diseases.

Effects of overland flow mechanisms on phosphorus export from grassland soils.

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Soil structure is the arrangement of soil particles in the soil and can be described as the architecture of the soil. This is because soil structure refers to the physical construction of the soil or arrangement of the soil particles, like building blocks in a wall. The particles bind together to form solid aggregates, but also the empty spaces and pores within and between aggregates. These aggregates and pores influence root penetration and water movement, and hence, exert an influence on nutrient dynamics. Phosphorus (P) is a macronutrient, essential for crop growth. Certain forms of P in the soil are not available to the plant for uptake, referred to as legacy P. Legacy soil P prolongs the agricultural source pressure to freshwater quality. The influence of soil structure, and runoff generation mechanisms on the form of phosphorus loss is not fully understood. Models of P transport assume either saturation excess (SE) or infiltration excess (IE) as the triggering mechanism for P loss via runoff. SE runoff may lead to higher dissolved P losses, due to a) lower applied energy hence less physical separation of particulates, and/or b) greater mobilisation of P from sorbed reserves during antecedent saturation. Conversely, IE runoff may lead to greater particulate P loss due to increased physical separation. Structure, and contingent runoff mechanisms, is therefore likely to impact not only gross P loads but also surface water chemistry. The influence of soil structure, and runoff mechanism (SE or IE) on forms of P loss from grasslands was examined through a simulated rainfall trial. Results indicate that the influence of runoff mechanism on P losses was contingent upon soil bulk density. Particulate P was consistently the dominant form of P loss across all runoff and bulk density scenarios. For particulate P, flow-weighted mean concentrations were greatest under saturation excess runoff at high bulk density. For dissolved P, the highest flow-weighted mean concentrations were observed under infiltration excess runoff at high bulk density. These results highlight that soil bulk density typically exerts a greater influence on P losses than does the runoff generation mechanism. Management of soil structure in hydrologically sensitive areas may therefore present as a means to mitigate P loss. Furthermore, catchment-scale models of nutrient loss may benefit from parameterisation of soil bulk density.

The Role of Endomycorrhizal Fungi in Irish Fen Restoration

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Peatlands and bogs cover an expansive global range, and are present on all continents except for Antarctica, covering 3% of the total land area globally. These unique habitats are efficient carbon sequesters, with degraded peatlands quickly becoming a net carbon source. Anthropogenic influences, particularly in the form of peatland drainage, are a leading cause in the degradation of the habitats, with projections indicating a potential 25% decline in the number of peatland and bog habitats by 2025. This is particularly evident in Ireland, where 16% of the total land area being classified as peatland and bog compared with pre-industrial revolution levels of 25%. Plant-fungal relationships have existed for 400 million years and are present in the roots of 70-90% of land plant species. Until relatively recently endomycorrhizal relationships were thought to be unusual in wetland plants. However, increasing research has shown that mycorrhizal colonization should be considered beneficial for wetland restoration. The primary role of arbuscular mycorrhizal fungi (AMF) is to provide plants with nutrients like phosphorous by extending their root systems allowing for greater absorption, while the plant provides the AMF with a steady carbon source. AMF have also been shown to reduce nutrient leeching in nutrient poor soils. In doing so they increase their hosts stress tolerance by amplifying the nutrient and water availability. The focus of this study was on Irish fens, which represent the least studied peatland type in Ireland. Our research primarily focused on identifying AMF species present in various vascular plants actively growing on the peatland surface. Aiming to better understand the role of fungal species in minerotrophic peatland restoration and general growth characteristics of Irish fen habitats. To do this, collected root samples were stained to identify AMF networks present within the habitat. Subsequently, DNA metabarcoding was used for the parallel identification of all fungal species within each of the collected samples. Additionally, DNA barcoding, via Sanger sequencing, was used on root DNA dilutions to classify the main fungal classes present in our samples. This research is the first of its kind in Ireland and will significantly improve our understanding of plant-fungal interactions in these unlikely study areas while also contributing to terms set out in Paris Agreement for Climate Change in using Nature-Based Solutions to reduce Greenhouse Gas emissions through the restoration of fens.

A rhizobial xanthine/uric acid transporter affects the bioenergetic metabolism of the nodule in *Medicago truncatula* – *Sinorhizobium meliloti* symbiosis

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Introduction: When the bioavailable nitrogen in the soil is limited, legumes develop symbiosis with rhizobia and form root nodules. Inside nodule plant cells, the differentiated rhizobia (bacteroids) perform symbiotic nitrogen fixation (SNF) and exchange the fixed nitrogen for reduced carbon and nutrients provided by their host. Previously, we produced a *Sinorhizobium meliloti* strain carrying a knockout mutation for a xanthine/uric acid Nucleobase-Ascorbate Transporter (NAT) gene and demonstrated the importance of this transporter for the efficiency of SNF, in the *Medicago truncatula* – *Sinorhizobium meliloti* symbiosis. Here, we used the heterologous system of *Mesorhizobium loti*, which lacks NAT transporters, to express this xanthine/uric acid transporter gene under its native promoter and analyzed the effects on xanthine transport and *M. loti* growth. Furthermore, we checked the bioenergetic metabolism of the symbiotic *S. meliloti* transporter-knockout strain to understand the way via which the transport of xanthine affects SNF.

Materials and Methods: *M. loti* cells were electroporated with a plasmid carrying the xanthine/uric acid NAT gene and its native promoter, or with the control plasmid. The growth of free-living transformed *M. loti* was monitored in liquid cultures containing xanthine or NH_4^+ as sole nitrogen source and the uptake of xanthine was tested at the exponential phase. In *M. truncatula* plants inoculated with *S. meliloti* wild type or the transporter-knockout strain, we analysed (RT-qPCR) the expression of rhizobial genes involved in the Citric acid/Glyoxylate cycle, and the expression of plant genes related to glycolysis or to the establishment of oxygen-limiting conditions in the nodule.

Results: The *S. meliloti* xanthine/uric acid NAT gene was successfully expressed by its native promoter in *M. loti* cells and contributed significantly to xanthine uptake and growth, when xanthine was used as the sole nitrogen source. In the *Medicago truncatula* – *Sinorhizobium meliloti* symbiosis, the mutated *S. meliloti* exhibited induction of the part of the Glyoxylate cycle that drives the production of malate, while the conversion of malate to oxaloacetate (Citric acid/Glyoxylate cycle) or to pyruvate (gluconeogenesis) was reduced. Additionally, the Citric acid cycle was inhibited downstream to a-ketoglutarate, while a-ketoglutarate was probably used for biosynthetic purposes. Moreover, in these nodules, the expression of *M. truncatula* genes involved in glycolysis or in the creation of oxygen-limiting conditions was reduced.

Conclusion: The *S. meliloti* xanthine/uric acid NAT significantly contributes to xanthine uptake and growth on xanthine and affects the bioenergetic metabolism of both nodule partners, possibly influencing the differentiation/function of *S. meliloti* bacteroids.

Molecular Targeting of FAR Proteins in Plant-Parasitic Nematodes: A Step Towards Sustainable Crop Protection

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Introduction: Plant-parasitic nematodes have a major impact on global food production system. Total loss of crop yield due to these nematodes' activity is estimated to be 170 million Euros annualy. *Meloidogyne incognita* is a root-knot nematode (RKN) that selects specific host cells for the establishment of specialized sites and secretes a variety of proteins, including FARs, which bind fatty acids that serve as precursors for membrane biosynthesis. In this way nematode's survival and reproduction is supported. Nematicides have been used to control these parasites; but studies show that they are toxic for the ecosystem and human health. This study focuses on binding properties of FAR proteins using fluorescence-based assays with retinol as a ligand candidate aiming to better understand their molecular function and ligand specificity. Elucidating these interactions is essential for the rational design of novel inhibitors that could block FAR protein activity, thereby reducing nematode infectivity and contributing to the development of sustainable crop protection strategies.

Methods: Mi-FAR-1 protein was overexpressed in *Escherichia coli* BL21 cells using Luria Bertani Medium. Protein purification was started by Affinity Chromatography, followed by Ion Exchange Chromatography. The yield of culture was 13 mg/L. Due to the high purity of Mi-FAR-1, fluorescence- based assays were performed in the absence and presence of retinol in 96-well plate using Varioskan LUX Microplate Reader.

Results: Fluorescence-based studies showed that the signal of Mi-FAR-1 in the absence of retinol was weak, as was that of retinol alone. Upon gradually increase of protein concentration in a retinol- containing solution, a corresponding increase in fluorescence signal was observed. The binding exhibited an association constant (K_a) on the order of 10^6 M^{-1}.

Discussion: The binding of retinol to the protein's binding site is strong, as confirmed by experiments with other homologues proteins. This provides an opportunity to design an analogue capable of inhibiting the protein's activity, thereby mitigating its effects on the cultures.

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Enhancing Maize Resilience to Combined Drought and *Fusarium proliferatum* Stress via Root Endophytic Symbiosis with *Serendipita indica*

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The increasing occurrence of simultaneous abiotic and biotic stresses, particularly drought and soil-borne pathogens, represents a major challenge for sustainable maize production. This study investigated the role of the root endophytic fungus *Serendipita indica* in enhancing maize (*Zea mays* L., hybrid ZP684) tolerance to combined drought stress and *Fusarium proliferatum* infection. Maize plants were subjected to different irrigation regimes (100%, 75%, 50%, and 25% of field capacity) under both individual and combined stress conditions. A total of 19 morphophysiological and biochemical parameters were evaluated, including growth traits, chlorophyll content, antioxidant capacity, phenolic compounds, flavonoids, and proline dehydrogenase activity. Results demonstrated that combined stress conditions caused more severe reductions in plant performance compared to individual stresses. However, inoculation with *S. indica* significantly improved plant tolerance across all stress levels. Under severe drought (25% irrigation), inoculated plants showed increases of up to 12.9-fold in fresh shoot weight and 1.65–1.75-fold in key growth parameters such as leaf and stem length. Under combined stress conditions, *S. indica* enhanced fresh shoot weight by up to 4.9-fold and root length by 1.83-fold compared to non-inoculated plants. Additionally, chlorophyll content increased by approximately 27–46%, while phenolic and flavonoid contents were notably elevated. Antioxidant activity, measured as free radical scavenging capacity, increased up to 2.8-fold under severe combined stress conditions. Overall, *S. indica* effectively mitigated oxidative damage, improved physiological performance, and enhanced plant defense responses under both individual and combined stresses. These findings highlight the potential of root endophytic fungi as a sustainable and eco-friendly strategy for soil health improvement and biological disease management in maize production systems.

Keywords: *Serendipita indica*, maize, drought stress, *Fusarium proliferatum*, endophytic fungi, combined stress, biological control, sustainable agriculture

Screening of novel bio-based recycling fertilizers to evaluate their effects on germination, nutrient uptake and biomass yield in selected crops

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Bio-based recycling fertilizers (BBFs) are increasingly important for closing nutrient cycles and reducing dependence on mineral phosphorus (P) fertilizers, particularly in stockless organic farming systems. Marine residues such as algae, fish meal, and fish bones represent promising but underexplored feedstocks for BBFs. This study evaluated the effects of several marine-derived and established recycling fertilizers on germination, biomass production, and P uptake in spring wheat (*Triticum aestivum*), ryegrass (*Lolium perenne*), faba bean (*Vicia faba*), and alfalfa (*Medicago sativa*) in two greenhouse pot experiments. Eleven fertilizer treatments—including struvite, digestate, fish meal, fish bones, algae products, and acidified slurry—were compared with a mineral triple superphosphate (TSP) reference and an unfertilized control. Biomass production and P uptake showed strong crop-specific responses. Struvite significantly increased P uptake across all crops and performed comparably or superior to TSP. Digestate produced the highest biomass yields, likely due to its high nitrogen availability. Fish meal enhanced wheat biomass by up to 37%, while fish bones improved P uptake in wheat but had limited effects on legumes. In contrast, pure algae strongly inhibited germination and early seedling growth, reducing germination rates to 11%, likely due to salinity and a high C/N ratio. Algae compost, however, increased P uptake in faba bean without negatively affecting biomass.

Overall, the results highlight the agronomic potential of selected marine-derived BBFs, particularly fish-based fertilizers and struvite, while also emphasizing the importance of fertilizer composition, nutrient solubility, and crop-specific nutrient acquisition strategies. The findings support the integration of BBFs into sustainable nutrient management but underline the need for further research under field conditions and with soils of lower P status.

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Harnessing Algae-Derived Biostimulants to Enhance Crop Resilience and Productivity. A Multi-Omics and Digital Twin Approach

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Global agriculture faces escalating threats from climate change-induced abiotic stressors as drought, heat, and salinisation causing yield losses of up to 50–70%, while synthetic fertiliser overuse continues to degrade soil health and aquatic ecosystems. Microalgae-derived biostimulants represent a sustainable alternative, as these fast-growing photosynthetic organisms produce a diverse array of agronomically active compounds phytohormones, polysaccharides, PUFAs, and carotenoids with demonstrated capacity to enhance plant growth, nutrient acquisition, and stress resilience.

This PhD research, conducted under the EU-CONEXUS ENABLES (Horizon Europe) framework in co-tutelle between the Agricultural University of Athens (AUA) and the Catholic University of Valencia (UCV), investigates microalgae-derived biostimulants through an integrated multi-omics and Digital Twin approach. The project encompasses microalgal biomass production and biochemical characterisation under control and stress conditions, extract preparation and phytochemical profiling, microbiome characterisation to elucidate its modulatory role in biostimulant bioactivity, and transcriptomic and metabolomic analysis of treated crop plants to resolve underlying molecular mechanisms. A Digital Twin framework will integrate these datasets for predictive application optimisation.

Outcomes will deliver mechanistic insight into algae-crop interactions, validated field-transferable protocols, and open multi-omics datasets, directly advancing EU Farm to Fork Strategy objectives and contributing to a sustainable, circular European bioeconomy.

Electrochemical Detection of Azoxystrobin in Lettuce Matrices via Molecularly Imprinted Polymers

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Organic pollutants, particularly agrochemical fungicides, pose significant risks to aquatic ecosystems and human health. Strobilurins, such as Azoxystrobin (AZO), are a dominant class of broad-spectrum fungicides that inhibit fungal mitochondrial respiration.[1] While essential for crop yields, their intensive use has led to environmental contamination and pathogen resistance, prompting the EU to mandate strict pesticide reduction targets. To ensure food safety, global agencies (EU, USA, China) enforce Maximum Residue Limits (MRLs). Residues' detection relies on Liquid/Gas Chromatography and Mass Spectroscopy; however, these methods are expensive, time-bound, and require sophisticated instrumentation.[2] As a portable alternative, biosensors offer rapid, sensitive, and cost-effective on-site monitoring. Electrochemical biosensors utilize biorecognition elements, including antibodies, aptamers, enzymes, or Molecular Imprinted Polymers (MIPs). MIPs are synthetic polymers formed via molecular imprinting, where a target molecule acts as a template around which monomers polymerize, creating cavities with a shape complementary to the target analyte.[3] The rebinding of the analyte molecule can be detected via electrochemical methods, such as Electrochemical Impedance Spectroscopy (EIS), providing a robust tool for environmental and agricultural surveillance. In this study, we created a MIP film onto the surface of gold screen-printed electrodes via chronopotentiometry. The functional monomers selected were Aniline and meta-Phenylenediamine. For comparison purposes, we also created Non-Imprinted Polymer (NIP) films. The sensor was then exposed to known concentrations of AZO to establish a calibration curve. The lowest concentration detected was 0.2μM. This process was carried out not only for MIPs but also for NIPS. Trifloxystrobin, another Strobilurin fungicide, was used to evaluate the sensor's selectivity. Furthermore, the sensor was also validated against lettuce samples (commercially available and organic lettuce matrices). Solid phase extraction was implemented on lettuce samples (QuEChERS), and the eluates were also analysed with HPLC. Our data suggest that the AZO sensor could be utilised in the near future as a cost-effective, on-site detection tool for AZO in several crops.

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Isolation of Fungi from Environmental Sources and TLC Screening for Ochratoxin A in Wine and Beer Samples

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Mycotoxigenic fungi represent an important concern in microbiology, food safety, and public health due to their ability to produce toxic secondary metabolites known as mycotoxins. Among them, ochratoxin A (OTA) is one of the most significant mycotoxins because of its toxicological effects and frequent occurrence in food products. According to the International Agency for Research on Cancer (IARC), OTA is classified as a possible human carcinogen (Group 2B). OTA is mainly produced by fungal species from the genera Aspergillus and Penicillium, including *Aspergillus ochraceus*, *Aspergillus carbonarius*, and *Penicillium verrucosum*.

During the Student Research Hub project, students were introduced to fundamental microbiological laboratory techniques, including preparation of culture media, inoculation of samples obtained from soil, plant material, and air, as well as isolation of pure fungal cultures. Fungal cultivation and morphological determination were performed using macroscopic and microscopic characteristics, while identification of fungal isolates was carried out using the identification key Food and Indoor Fungi (Westerdijk Fungal Biodiversity Institute).

The challenge of this project was the determination of ochratoxin A in three wine samples and two beer samples produced by local manufacturers. The study included mycotoxin extraction procedures followed by qualitative Thin Layer Chromatography (TLC) analysis for OTA detection. The results showed that ochratoxin A was not detected in any of the analyzed wine and beer samples, indicating satisfactory safety and quality of the tested products from local producers.

Microbial community and spoilage development in refrigerated marine fish during cold chain distribution and storage

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Large quantities of fish and seafood are wasted globally due to spoilage occurring at different stages of the cold chain, including chilling, packaging, distribution and storage. This study explored bacterial community dynamics and spoilage development in four commercially relevant fish species (*Sparus aurata*, *Pagrus major*, *Dicentrarchus labrax*, and *Argyrosomus regius)* harvested from different regions of Greece and stored aerobically at 2 °C as whole fish or fillets. Spoilage progression was characterized using an integrated approach combining high throughput 16S rRNA gene sequencing, conventional microbiological enumeration, physicochemical analyses, and sensory evaluation. Temperature was continuously monitored from harvest through storage until the end of shelf life.

Initial microbial loads varied among samples and were partly associated with the recorded time–temperature history. However, alpha diversity (Shannon index) did not differ significantly among fish species, geographic origin, or product type ($p>0.05$). Beta diversity analysis showed no clear clustering based on origin or product type, indicating a limited effect on microbial community composition. In contrast, storage time was identified as the principal factor shaping microbial dynamics. Principal coordinate analysis consistently separated early and late storage stages across all species, indicating pronounced microbial succession during chilled storage.

At the phylum level, microbial communities were dominated by *Proteobacteria*, with *Firmicutes* and *Actinobacteria* present in lower proportions. At finer taxonomic resolution, storage progression was associated with a clear shift toward psychrotrophic, spoilage-associated genera. *Pseudomonas* and *Psychrobacter* became dominant at advanced stages across several fish species, while *Flavobacterium*, *Shewanella*, *Aeromonas*, and *Acinetobacter* showed species- or product-dependent patterns. These microbiome shifts coincided with increased microbial counts, pH changes, and sensory rejection, linking microbial succession to functional spoilage and highlighting key taxa as potential biomarkers for monitoring spoilage in chilled marine fish.

Predictive modelling for fish and seafood processing and preservation

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Predictive modelling has become an essential tool in fish and seafood processing for evaluating product quality, optimizing preservation conditions, and estimating shelf life under dynamic storage environments. This work presents a methodological framework for predictive modelling applied to seafood processing and preservation, with emphasis on kinetic modelling, accelerated shelf life testing and thermal process evaluation.

The methodology begins with the identification of critical quality indicators associated with seafood deterioration, including microbial growth, lipid oxidation, total volatile basic nitrogen, texture, colour and sensory attributes. Experimental shelf life studies are conducted under controlled storage temperatures to accelerate quality degradation and generate kinetic datasets. Primary microbial growth models are applied to describe spoilage dynamics and estimate important kinetic parameters including lag phase duration and maximum growth rate. Quality deterioration kinetics are further described using zero-order and first-order reaction models, while the influence of temperature on deterioration rates is quantified through Arrhenius modelling. These models enable prediction of shelf life under various storage and distribution conditions. Case studies involving real fish and seafood products demonstrate the practical application of predictive modelling for estimating shelf life, evaluating cold-chain performance and quantifying quality loss caused by temperature fluctuations. In addition, the methodology incorporates thermal process modelling by combining microbial thermal resistance parameters, such as D-values and z- values, with heat transfer and quality degradation kinetics. This integrated approach supports optimization of thermal treatments to ensure microbial safety while minimizing quality deterioration.

Overall, predictive modelling provides a powerful scientific and industrial tool for improving seafood quality management, process optimization and shelf life prediction throughout the seafood supply chain.

Influence of fish meal and fish oil replacement on the plasma biochemical profile of European sea bass (*Dicentrarchus labrax*)

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In recent years, aquaculture has expanded rapidly, becoming one of the most competitive animal production sectors, with European sea bass (*Dicentrarchus labrax*) as a key species in Mediterranean farming. This growth is largely supported by the use of nutritionally balanced aquafeeds, which increasingly replace marine ingredients with plant-based alternatives to enhance sustainability. However, plant-based feeds contain phytoestrogens that may influence fish physiology, usually reduce plasma LDL and total cholesterol levels and act as antioxidants.

In this study, European sea bass was reared for three months and fed four isoenergetic and isonitrogenous diets: a control diet containing fish oil (FO rich in n-3 HUFAs) and three experimental diets in which 80% of FO was replaced with soybean oil (SBO rich in 18:2n-6), rapeseed oil (RO rich in 18:1n-9), or a 1:1 mixture of SBO and RO (SBO-RO). Oiling was done after extrusion of the basic feed, which was the same in all diets and contained, among others, 30% fishmeal, 18% soybean, 12.5% fish oil and similar levels of phytoestrogens. At the end of the trial, blood samples were collected to assess lipid and lipoprotein profiles (CHOL, TG, LDL, HDL), metabolic indicators (ALB, GLU), enzymatic activity (ALP, LDH, GPT, GOT), and antioxidant enzymes (CAT, SOD). Viscerosomatic Index (VSI) and Hepatosomatic Index (HIS) were also measured.

The SBO diet led to similar levels of VSI and HSI as FO, but lower levels of total CHOL and higher levels of plasma ALP, ALB and TG, indicating greater bile acid deficiency and liver dysfunction in sea bass fed SBO compared to FO. Lipolysis with SBO led to an increase in plasma TG and to lower levels of plasma LDL, HDL, LDH and GPT compared to FO. Analyses of antioxidant enzymes indicated higher activity in fish receiving SBO, suggesting an improved antioxidant capacity, which may be influenced by phytoestrogen content. In contrast, RO diet led to reduced lipolysis and higher levels of HDL in plasma. Increased anaerobic glycolysis with the RO and RO-SBO diets may have contributed to the greater levels estimated for VSI and HSI compared to the FO and SBO diets. However, the FO diet led to statistically significantly lower plasma TG levels compared to RO and the other alternative diets with the lowest levels of n-3 PUFAs, due to the mechanisms that these fatty acids possess to achieve a more efficient reverse cholesterol transport compared to monounsaturated and much more than n-6 PUFAs.

From anti-biofilm activity to anticancer potential: investigation of metabolites produced by marine bacterial consortia

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Introduction: Cancer progression is characterized by competition among cells for nutrients, survival, and proliferation, similar to processes observed in microbial communities. Many cancer cell characteristics resemble microbial ones [1]. Like bacterial biofilms, tumor microenvironments are highly heterogeneous, with gradients in pH, oxygen levels, and nutrient availability, often limiting effective drug delivery. Moreover, biofilm dynamic and cancer metastasis share key biological steps, including detachment, circulation, survival, and colonization of distant tissues, suggesting the involvement of common chemical mediators [2]. These parallels support the development of innovative bacteria-based anticancer strategies. In this context, marine bacteria represent a particularly valuable and underexplored source of bioactive metabolites due to their unique adaptation to extreme and competitive environments, which drives the production of structurally diverse and potent secondary metabolites.

Objectives: The objective of this study is to investigate whether marine bacterial consortia, pre-selected for anti-biofilm and antibacterial activities, can serve as a source of bioactive metabolites with anticancer properties, by evaluating both their cytotoxic and anti-adhesion effects on breast cancer models.

Methods: Marine bacterial consortia were cultivated under both liquid and solid culture conditions to produce secretomes. These were tested *in vitro* on MCF-7 (luminal subtype), MDA-MB-231 (triple-negative subtype) cancer cell lines, and the HSK-MEC endothelial cell line. Cytotoxic effects were assessed for both crude secretomes and fractions obtained using C18, Diol, SAX, and SCX chromatographic separation methods. Anti-adhesion activity was evaluated using fluorescently marked cancer cells co-incubated with endothelial cells to assess interference in the metastatic process.

Findings and conclusions: Most secretomes induced a dose-dependent reduction in cancer cell viability, with some showing a selective toxicity against the aggressive triple-negative breast cancer cells. These findings demonstrate that consortia of functionally pre-selected marine bacteria represent a promising and innovative approach for developing new cancer therapeutics, combining cytotoxic and anti-adhesion activities. Overall, this study highlights the potential of carefully selected bacterial consortia as sources of bioactive compounds for bacterial-based cancer therapies.

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Unveiling Tocopherol production in *Tetradesmus obliquus*: From spectrophotometric stress monitoring to multi-omics analysis

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Climate change is an escalating global issue that significantly impacts microalgae, which are key aquatic primary producers responsible for over 50% of global photosynthesis (1). However, understanding their responses to environmental stress is essential, not only from an ecological perspective but also due to their great potential as sources of high-value metabolites (2). Due to their metabolic plasticity, microalgae can modulate their biochemical composition under stress conditions, enabling the enhanced production of compounds such as tocopherol (vitamin E), a molecule with strong antioxidant and photoprotective properties (3). Although factors such as light intensity and nutrient availability are considered to influence tocopherol accumulation, the underlying mechanisms remain poorly understood.

Therefore, in this study, we investigated stress responses in *Tetradesmus obliquus*, a fast-growing and stress-tolerant freshwater microalga. Spectrophotometric monitoring was employed, focusing on the relationship between chlorophyll degradation, tocopherol production and tocopherol-associated photoprotection. A two-phase strategy was applied to obtain a stationary phase culture, then a second step included a long N-P starvation followed by a highlight intensity at low cell density to induce a photoprotective reaction as response to an oxidative stress culture condition. Culture was monitored during regular and stressful conditions in terms of cell density (cells/ml), optical density at 750nm (OD_{750}), to monitor growth progress during regular culture and cell survival under stress conditions. Chlorophylls/Pheophytins rate was monitored by spectrophotometry to unveil the right starting point for Chlorophylls degradation pathway. Vitamin E, as ending point of the previous metabolic pathway, was monitored through a specific assay kit to verify both metabolic pathways coupling.

These results allowed the identification of specific stress conditions that induce distinct physiological responses including alterations in chlorophyl and tocopherol metabolism. Based on these findings, selected conditions will be further examined using a multi-omics approach, integrating total RNA sequencing (RNA-seq) and untargeted metabolomics (GC–MS). This combined strategy aims to elucidate the molecular and metabolic mechanisms underlying stress adaptation in *T. obliquus*, with particular emphasis on the pathways involved in tocopherol biosynthesis.

The research project is implemented in the framework of EU-CONEXUS ENABLES Post-Doctoral Research Programme 2025–2026 (funded by the European Research Executive Agency through Horizon Europe, Grant Agreement No. 101136822).

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Blue Biomass for Sustainable Packaging: Biobased Films from Microalgal Whole Biomass and Exopolysaccharides

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The growing demand for sustainable food packaging materials has intensified the investigation for renewable resources within the emerging blue bioeconomy. Among these, marine microalgae represent a promising resource due to their rapid growth, minimal land requirements, and diverse biochemical composition.

In this study, biodegradable films were developed using whole biomass from two microalgal species and exopolysaccharides (EPS) produced by *Porphyridium purpureum*, to evaluate their potential as marine-derived materials for food-contact applications. Commercial biomass of *Arthrospira platensis* and *P. purpureum* biomass obtained from fresh cultures, subsequently harvested, washed, and freeze-dried prior to use. EPS were recovered from the culture supernatant via cold ethanol precipitation and subsequently oven-dried. Film-forming solutions were prepared by hydrating the respective powders under controlled temperature and continuous stirring, followed by the addition of a plasticizer. The resulting mixtures were cast onto Petri dishes and dried at 40 °C for 15 h. Films were then conditioned in a saturated sodium bromide environment (58% RH) prior to analysis.

The developed materials were subjected to physicochemical and functional characterization, revealing promising properties. As a representative example, the *A. platensis* film exhibited adequate water barrier behaviour while remaining hydrophilic (contact angle < 90°), with low water content (17.25 ± 2.20%) and moderate water solubility (48.59 ± 3.11%). Minor antimicrobial activity was observed using the disc diffusion assay.

This study highlights the potential of ocean-derived biomass for the development of biodegradable packaging materials.

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Fighter Tomatoes: Regenerative Packaging and Circular Consumer Engagement in Sustainable Food Marketing

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The transition towards circular and regenerative food systems has become a major challenge for the fresh produce sector, where conventional single-use packaging continues to generate significant environmental impacts and non-biodegradable waste. In this context, the Fighter Tomatoes project proposes an innovative regenerative packaging model integrating sustainable materials, circular economy principles and consumer engagement strategies in collaboration with a fruit and vegetable processing company. The project was developed following eco-design and circular economy principles through material selection based on biodegradability, recyclability, compostability, food safety, durability and consumer usability criteria.
The project introduces a sustainable tomato packaging model developed using recycled corrugated cardboard, biodegradable seaweed film, and water-soluble eco-friendly labels. These materials were selected for their recyclability, compostability, lightweight structure, durability, food-safe properties and cost. Unlike traditional plastic packaging, this solution is designed to re-enter the material cycle after consumption. The project's central message, "We grow tomatoes, not waste," reflects this philosophy of combining sustainability with consumer participation.

Fighter Tomatoes also responds to the growing demand for environmentally responsible products among modern consumers. Current sustainability trends show that consumers increasingly expect companies to contribute positively to environmental protection rather than simply offering recyclable packaging. In response, the project promotes a transition from passive recycling behaviours to active participation in circular economy systems. Consumers are encouraged to reconnect with food production processes while reducing waste generation in their households.

The project further strengthens its impact through targeted marketing and educational strategies. Three packaging versions were developed to adapt the concept to different audiences: a children's educational kit designed to teach sustainability through interactive characters; an urban grow kit and a family-oriented home garden kit. In addition, the project incorporates digital engagement through QR-code technology that provides access to product journey information, environmental and sustainability education.

The project demonstrates the potential of regenerative packaging systems to integrate sustainability, environmental education and consumer participation into scalable food marketing strategies aligned with circular economy objectives

Equal benefits from different methods? A comparative study of *Salvia officinalis* decoction and infusion

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Salvia officinalis, commonly known as sage, is a perennial plant of the Lamiaceae family. It is the largest genus of this family and encompasses approximately 900 species, distributed worldwide. The aerial parts of the plant have long been used in traditional medicine and culinary applications due to their characteristic aroma and flavor. Nowadays, homemade decoctions and infusions of *S. officinalis* are still widely consumed, both as a wellness practice and as a remedy to alleviate mild cold symptoms. In this study, we prepared *S. officinalis* decoction and infusion using home-based methods, and we evaluated the antioxidant activity, the total phenolic content (TPC) and total flavonoid content (TFC) of the two extracts. Our results showed that the decoction preparation exhibited higher antioxidant activity as well as greater TPC and TFC compared to the infusion. These findings indicate that the extraction method plays a crucial role in the bioactive potential of the preparations. In this case, simultaneous boiling of the plant material with water at 100 °C enhanced the extraction of phenolic compounds and flavonoids, resulting in the superior antioxidant activity observed in the decoction.

Comparative evaluation of bioactive and antimicrobial properties in decoction and infusion beverages of *Origanum vulgare* L. spp. *hirtum*

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Origanum vulgare L. spp. *hirtum* (Lamiaceae), commonly known as Greek oregano, is a Mediterranean medicinal and aromatic plant of high commercial interest, due to its versatile uses, which include preparations for medicinal, cosmetic, culinary, and food preservation purposes. In this study, two traditional preparation methods, infusion and decoction, were used to extract the secondary metabolites from oregano leaves. The two extracts were studied for their antioxidant and antimicrobial activity. Total phenolic content (TPC) and total flavonoid content (TFC) were evaluated using the Folin - Ciocalteu and the Aluminum Chloride colorimetric assays, respectively, while the antioxidant capacity was assessed using DPPH and ABTS radical scavenging assays. Higher TPC and TFC were estimated for the decoction (TPC: 105.1 ± 1.6 mg GAE/g DM; TFC: 28.01 ± 0.1 mg QUE/g DM) than the infusion (TPC: 67.7 ± 1.9 mg GAE/g DM; TFC: 17.2 ± 0.3 mg QUE/g DM). Regarding the antioxidant capacity, the decoction showed a higher reducing activity (DPPH: 115.9 ± 1.6 mg/g DM; ABTS: 150.6 ± 10.4 mg/g DM) compared to the infusion (67.7 ± 3.1 mg/g DM; 89.2 ± 11.3 mg/g DM, respectively). The two preparations were also tested for their antimicrobial activity against Gram-positive (*Staphylococcus aureus*, *Enterococcus faecalis*) and Gram-negative (*Escherichia coli*, *Salmonella enteritidis*) microorganisms, using the minimum inhibitory concentration (MIC) assay. Both preparations exhibited antibacterial activity against all tested microorganisms, with MIC values ranging from 2 to 5 mg/mL. Overall, the decoction showed slightly lower MIC values against *S. enteritidis*, whereas the infusion showed marginally lower MIC values against *E. coli*, while no differences were observed for *S. aureus* and *E. faecalis*. In summary, the results indicated that prolonged extraction at 100 °C significantly enhanced the release of secondary metabolites, highlighting the potential of a properly prepared traditional daily beverage as a rich source of bioactive compounds.

Natural Products from *Salvia willeana* and *Salvia fruticosa* as Potential Agents for Eco-Friendly Control of Cyanobacterial Blooms

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The global increasing occurrence of harmful cyanobacterial blooms in surface waters represents a significant environmental and public health concern, primarily due to their ability to produce toxic metabolites. The latter ones can impact mammalian health in various ways including cytotoxicity, dermatotoxicity, hepatotoxicity, and neurotoxicity. The hepatotoxic derivative of microcystins, MC- LR, has been included in the drinking water EU Directive 2184/2020, hence it is mandatory to monitor its presence in drinking water. In response to the growing demand for sustainable and environmentally friendly mitigation strategies, natural products derived from medicinal plants are gaining attention as potential alternatives to conventional chemical treatments. In this context, the present study portrays the antioxidant and antimicrobial potential of extracts obtained from two species of the genus *Salvia*, namely *Salvia willeana*, an endemic plant of Cyprus, and *Salvia fruticosa*, a widely distributed Mediterranean species and their potential application as algaecides.

Plant material from aerial parts was extracted using solvents such as ethanol and ethyl acetate, followed by phytochemical and biological evaluation. Total phenolic (TPC) and flavonoid content (TFC) was determined using Folin– Ciocalteu and aluminum chloride methods, respectively, while antioxidant activity was assessed via the DPPH and ABTS assays. Antimicrobial properties were evaluated through determination of minimum inhibitory concentration (MIC).

The results demonstrated that ethanolic extracts of *S. willeana* had the highest levels of phenolic and flavonoid compounds, proving strong antioxidant potential. Conversely, *S. fruticosa* extracts showed superior radical scavenging activity (lower IC_{50} values) and notable antimicrobial effects, particularly in ethanolic extracts. Preliminary studies on inhibiting the photosynthetic activity of cyanobacteria (*Microcystis sp.* producers of MC-LR) have shown that moderate concentrations of the extracts (0,5 mg/mL) were able to completely impair their photosynthetic activity. These findings present the rich phytochemical profile and bioactivity of both *Salvia sp.*, suggesting their potential as sources of natural bioactive compounds with algaecide properties.

Overall, the integration of plant-derived natural products into environmental technologies offers a promising and sustainable approach for managing cyanobacterial contamination. Importantly, such compounds may contribute to the development of innovative, eco-friendly strategies for the *in-situ* remediation of surface waterbodies affected by toxic cyanobacteria.

Novel use of materials such as seaweed, green tea and shells in antimicrobial wound dressings.

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Chronic wound care is a global challenge impacting patients, healthcare systems and the environment. They are a persistent, painful burden that require long treatment, with repeated infection risk and antimicrobial overuse. In Ireland, wound care comprises 16% of public health nursing caseload and persist ~11.37 with potential inappropriate antibiotic use. Antimicrobial resistance (AMR) can occur leading to ineffective wound healing. Therefore, novel sources of antimicrobial dressings are continuously being sought after. In this work, three natural sources of antimicrobials are explored; seaweed extracts, shellfish shell waste and green tea. The aim is to develop novel sustainable smart-release wound dressings for chronic wounds, such as diabetic patients.The seaweed extract had antimicrobial efficacy against different strains of wound-associated MRSA, VRE, Group A Streptococci, Clostridium with activity as low as 10-80 µg/mL, lower than some commonly used antibiotics. When incorporated into hydrogel formulations, it effectively inhibited 70-90% bacterial populations within 30 min, followed by a sustained release up to 97 h. Comparison with commonly used silver-based dressing such as Acticoat®, Melgisorb®, Aquacel®, Actisorb® showed that it had comparable efficacy of effective period and rapid kill.The CaO samples from shells remained stable for 4 weeks when calcined at 850 °C and 1000 °C. Antibacterial activity demonstrated significant inhibition of *E. coli* and *S. aureus*, with zones of inhibition averaging 15 mm, and 17 mm, respectively when compared with the control. This is an example of the circular bioeconomy and waste valorisation with potential to produce high value-added products, resulting in a new revenue source for our industrial partners, Sofrimar.The encapsulation efficiency of green tea extracts (GTE) in phytosomes was 69.9±2.35%.. The average particle size was 198.6±0.35 nm, with a zeta potential of -18.23 mV, stable up to 60 days, with burst release followed by sustained release between 12-72h depending on phytosome formulations. Incorporation of these GT phytosomes into sodium Alginate films at 2.5% Calcium Chloride resulted in a stable wound dressing. However, more studies are currently undergoing to assess the stability, efficacy and toxicity of the GT phytosome-wound dressing.These materials represent a promising untapped source of antimicrobial agents that can be used in health care applications. The novel dressings have potential to compete with traditional dressings.

Simulation of wheat thermal behavior in metal silos for grain storage

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Access to safe food improves quality of life and increases life expectancy in a developed society. Storage in steel silos is a frequently used method of preserving grains after harvest. However, this type of storage encounters significant thermal accumulation leading to a gradual rise in the temperature of the stored grains, deterioration of nutritional quality, mold formation, proliferation of insects, and, in the most severe situations, complete spoilage of the grains. Therefore, careful monitoring of parameters and controlling thermal behavior of metal silo systems are required and crucial to maintain both quality and longevity of stored grains.

The main physical factors affecting stored grain quality are temperature and moisture content. Their high values increase the risk of spoilage, mold growth, and enzyme activity, negatively affecting the ability of stored grains to germinate. On the contrary, low temperatures do not damage stored cereals and therefore an aeration system is a convenient and economical means to address these issues.

Modeling is an indispensable part of the grain storage sector, allowing for understanding and optimization of the cereal storage process during ventilation with or without cooling systems. Unlike previous studies, this work proposes the development of a non-stationary mathematical model to simulate the temperature distribution of wheat grain in a metal storage silo during ventilation with both ambient and cooled air. The model also explores the effects of different air inlet and outlet positions on cooling efficiency. The simulation was carried out using the ANSYS Fluent, a computational fluid dynamics (CFD) software package. The fundamental conservation equations coupled with appropriate initial and boundary conditions allow the simulation of temperature evolution and distribution within the silo under various ventilation configurations. Also, a mesh sensitivity test was carried out to ensure the accuracy and stability of the numerical results. The criterion for selecting the optimum mesh size was based on the comparison between average temperature profiles in the silo, in particular their temporal evolution.

Simulation results demonstrate that for ambient air temperature over 40 °C ventilation with cooled air is mandatory for extending shelf life, reducing losses and guaranteeing the quality of stored product. The position of the openings plays a crucial role in maintaining grain quality and efficiency of cooling, as it directly influences the airflow distribution and the temperature profile.

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Genetic Identification of Mosquitoes in Ireland using a multi-sampling approach of direct and indirect samples

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Ecosystem services provided by insects include soil aeration, plant pollination and pest control. Insects also pose concern, particularly vectors for disease, such as some of the 3500 mosquito species that occur worldwide. Across Europe, cases of mosquito borne diseases have been recorded and are associated with anthropogenic changes. Mosquito monitoring is vital to create informed mitigation measures in advance of potential disease outbreaks. Morphological identification of mosquito larvae and adults requires a high level of expertise and is susceptible to error. Here, we demonstrate the application of DNA technology to identify mosquitoes from larvae, adults and indirectly from the diet of bats and water (i.e. environmental DNA (eDNA)) using a combination of DNA-based techniques including Sanger sequencing, DNA metabarcoding and real-time PCR (qPCR). Sanger sequencing facilitated the identification of previously unrecorded mosquito species in Ireland (*Culex torrentium* and *Culex quinquefasciatus*) and species biotypes (*Culex pipiens* biotype *pipiens*). Using DNA metabarcoding on bat faecal pellets a highly diverse diet was revealed and allowed for the identification of four mosquito species, including *Culex quinquefasciatus* again. Finally, species-specific qPCR assays were designed and optimised and allowed for the rapid detection of mosquitoes from water and bat faecal DNA. The combination of these molecular techniques have facilitated the identification of mosquito species occurring in Ireland via direct and indirect approaches and have allowed for updates to the Irish mosquito and overall arthropod diversity checklists to be made.

Reframing Disease Management through Educational Innovation: an interdisciplinary postgraduate model for health system capacity building

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Non-communicable diseases (NCDs) account for more than 70% of global mortality, yet the implementation of exercise-based interventions in clinical and community settings remains inconsistent. This gap reflects not a lack of scientific evidence, but limitations in interdisciplinary translation across domains such as sports science, medicine, and public health. Addressing this challenge requires educational models that prioritise integrative competencies over isolated knowledge acquisition. This study explores how an interdisciplinary postgraduate programme can function as a translational mechanism for exercise-based disease management. Drawing on the implementation of a Master of Science (MSc) in Sports, Exercise and Health Sciences (95 ECTS; ~18 months), we examine how structured educational design supports the integration of diverse disciplinary perspectives. Rather than focusing on curriculum structure, this work analyses emergent learning processes, including how students from different professional backgrounds engage with shared clinical and performance problems. Preliminary observations indicate that over 80% of participants actively engage in interdisciplinary tasks, demonstrating an increased ability to synthesise knowledge and apply exercise-based strategies in complex scenarios. From an innovation perspective, the programme introduces a scalable, distance-learning model that combines interdisciplinary interaction, applied problem-solving, and digital learning environments. This approach enhances accessibility and supports competency development across geographically dispersed populations. Importantly, the findings highlight the role of education within socio-cultural governance of disease management, as it shapes how future health professionals interpret evidence, collaborate across disciplines, and implement interventions in diverse contexts. By strengthening these capacities, postgraduate education can act as a translational platform bridging the gap between research and practice. This model is particularly relevant for coastal populations, where health disparities and accessibility challenges persist, and where integrated, sustainable approaches to disease management are required.

Posters
Session 2

A peptide-decorated *PilA* biosensor in *E. coli* for real-time environmental biosensing

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Real-time, low-cost detection of trace pollutants in freshwater is increasingly urgent as anthropogenic stressors intensify, yet conventional micro-electronic sensors rely on energy-intensive fabrication and contribute to a growing stream of toxic electronic waste. Electrically conductive protein nanowires (e-PNs), assembled from the type-IV pilin PilA of Geobacter sulfurreducens, are an emerging class of biomaterials that combine high conductivity, room-temperature aqueous stability, and easy genetic re- engineering. Published proofs-of-concept already demonstrate e-PN-based sensors for ammonia and humidity, but their potential as a modular sensing platform for aquatic pollutants is largely unexplored.

We propose an engineered E. coli chassis that produces functionalized e-PNs designed for selective detection of aquatic contaminants. The chassis carries two plasmids: one encoding a synthetic pilA gene whose C-terminus is fused to a short, analyte-binding peptide (e.g. the Pb^{2+}-binding loop of PbrR from Cupriavidus metallidurans), and a second carrying the previously published Geobacter pilus- assembly machinery. Expression is driven by an inducible promoter (pBAD), enabling biomass accumulation prior to nanowire production. The decorated nanowires are mechanically sheared, purified, and deposited as a thin film bridging two microelectrodes. Selective binding of the target analyte to the surface-exposed peptide tags perturbs film conductivity, producing a measurable current change as the readout signal.This modular platform of a single nanowire scaffold compatible with arbitrary peptide tags supports rapid retargeting to different pollutants. Because the device is biologically produced from renewable feedstocks, biodegradable after use, and aqueously stable during use, it offers a green, low-footprint alternative to conventional sensing electronics for aquatic environmental monitoring.[1–3]

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ARMS-MBON technology for environmental monitoring in ports

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This study investigates benthic biodiversity in ports of the Gulf of Valencia using the standardized ARMS-MBON (Autonomous Reef Monitoring Structures of the Marine Biodiversity Observation Network) methodology. Monitoring benthic communities in harbours and other human-impacted marine environments is essential for assessing ecological status, detecting pollution-related changes, and managing ecological risks associated with anthropogenic disturbance. Because these communities respond sensitively to environmental stress, changes in their composition and diversity can reveal degradation processes, including the establishment of non-indigenous or invasive species that may alter ecosystem functioning. The main objective of this work is to compare biodiversity patterns among three port types and to evaluate the applicability of this methodology to other marine areas under human pressure. The study focuses on three ports in the Gulf of Valencia, Spain: Pobla de Farnals (marina), Denia (fishing port), and Valencia (international cargo port). Three ARMS units were deployed in each port and remain submerged for approximately three months, from July to October 2025. After retrieval, the structures were processed in the laboratory following standardized protocols to recover the colonizing biological material. Molecular analyses have been conducted on the material scraped from the ARMS plates using COI, 18S, and 16S metabarcoding for taxonomic identification. Expected results include the characterization of the biological communities associated with each port and the detection of differences related to pollution-indicator taxa, species typical of confined waters, and potential non-indigenous species introduced by maritime traffic. In addition, our study will assess the effectiveness of ARMS-MBON as a biodiversity monitoring tool in directly impacted environments such as ports and aquaculture facilities. In the longer term, this approach could support monitoring strategies for local impacts and biodiversity hotspots, with future applications in aquaculture systems, marine protected areas, and sites of particular importance for the conservation of endangered species.

Variations in environmental water quality in port marine environments: a comparative study under altered conditions

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Port environments are particularly sensitive areas from an ecological perspective, due to the high concentration of human activities and low water renewal dynamics. This study evaluates the environmental quality of the water in the Port of Sagunto (Valencia, Spain), considering two factors of alteration: dredging operations and the installation of artificial reefs (ARs) for environmental improvement. The objective was to assess the effect of these agents in different areas (port canal, area with ARs installed in 2022 and nearby natural area). This was analysed applying various environmental indices to characterise the ecological status of the system. Sampling surveys were carried out before (January 2025) and immediately after the extraordinary dredging operations to improve the draught (April 2025). Oceanographic data collection included turbidity, dissolved oxygen and chlorophyll-a, nutrients and suspended solids. These parameters were used to calculate the four indices used to determine the environmental quality of the waters: FAN, TRIX, TRBIX and AZCI. The FAN index classified the quality as 'poor', although with methodological limitations in port contexts. In contrast, the TRIX index reflected an oligotrophic state, the TRBIX allowed the origin of the turbidity to be identified, and the AZCI indicated an environmental quality considered 'good' for an area with anthropogenic impacts. The combination of different indices allowed for a more nuanced interpretation of the results and a more complete environmental assessment of the impact of dredging on the port itself, the surrounding natural environment, and areas with anthropogenic impact containment measures (AR zones).

Using urban stormwater & rainwater as alternative sources to sustain urban lakes

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Urbanization impact on surface water and groundwater gradually became an important subject due to the continuous expansion of cities, climate change, water scarcity, and water quality degradation [1]. In addition, this has led to a huge rise in critical issues such as over population, excessive demand of resources and services, lack of fertile land, exploitation of natural resources, increase in pollution, poor air quality, degradation of forests and land and many more.

Globally, surface water quality is facing widespread problems caused by anthropogenic activities, such as natural processes, climate change, and global warming. Surface water bodies are ecosystem services that support local biodiversity. Similarly, when surface water bodies are polluted, the biodiversity depended on it starts to decline. Eventually, it completely loses its ecosystem. Adverse effects of depleted ecosystem are seen at local to global level [2]. Thus, pollutants due to urbanization may decrease surface water and groundwater quality, and impair aquatic ecosystems and water use for human consumption, irrigation and recreation [3]. It is for this reason water quality of existing water bodies must be monitored before exploring alternative measures.

Since 2006, there has been a pronounced decrease of the water level of the Lacul Circului (Circus Lake), located in the city of Bucharest, Tei district area [4]. The water level has suffered a sharp drop in the last 25 years by 1.2-1.4 m [5]. Currently, the water level in Circus Lake is maintained at about 1.4 m below the initial level by pumping water from the second aquifer layer. To avoid the lake drying out, alternative water resources are needed to sustain the lake's water level. This study focuses on possibility of restoring and maintaining the water level in Circului Lake by capturing stormwater and rainwater in the adjacent urban area and using these alternative water resources.

The main objective of the research is to examine the existing quality of stormwater and rainwater in the adjacent urban area and compare it with that of Lake Circus and the urban aquifer, with which the lake has direct hydraulic contact. The results indicate the potential pollution risks associated with stormwater and rainwater from two monitoring periods (2024 and 2025) collected in the urban area surrounding Circus Lake and highlight the benefits of implementing nature-based solutions for stabilizing the lake's water level.

Keywords: water quality, urbanization, alternative water resources, climate change

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Waste shells as low-cost materials for wastewater treatment and nutrient recovery

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Shells are major by-products generated by shellfish companies and represent a significant cost to the industry. Traditionally, these wastes have been discarded at sea or landfill, which can adversely affect soils, water and marine ecosystems[1]. One solution is to use these shells for some applications in agriculture, construction or chemical productions, most of which are generally low economic value[1].

Water is a vital resource for life but is increasingly threatened by pollution such as eutrophication caused by excessive nutrients accumulation (notably nitrate and phosphate, which are also a finite resource) and microbial contamination. These challenges pose risks to public health, food security and economic development. In order to support a circular economy, there is a growing need to utilise waste shells for environmental applications and also generate economic value.

This study addresses the research question: *Can shell waste be utilised as an untapped resource for removing excessive nutrients (phosphate and nitrate) and microbial contaminants from water?*

The research investigated the potential of using shell waste, both in its natural and heat-treated form, for the adsorption of phosphate and nitrate from wastewater, along with its capacity in reducing bacterial bioburden.

A face central composite design (CCD) within a Design of Experiment (DoE) framework was used to optimise batch adsorption conditions for phosphate removal. The optimum condition for phosphate adsorption was found to be at pH 4.5 using an initial shell concentration of 0.2g and an adsorption dose of 90mg/mL. The maximum adsorption capacity was found to be between 8.8-9.49 mg/g, depending on the types of shells. Calcination of the shells was found to significantly improved phosphate adsorption, achieving 90% phosphate removal within 3h 15 min.

Similarly, the calcined shells demonstrated effective antibacterial properties against *S. aureus* and *E. coli*, with bactericidal effects observed within 2 h contact period. Preliminary treatment of wastewater from a shellfish processing plant showed that the calcined shells can effectively remove 97% phosphate, 95% nitrate and 100% *E. coli* bioburden. Notably, improvements in both colour and smell of the treated wastewater were observed.

This study showed that shell waste can serve as an effective and sustainable material for water treatment, enabling the removal of bacterial contaminants and recovery of finite nutrients such as phosphate and nitrate. These findings support development of a circular blue economy and contribute to the achievement of UN SDG goal, particularly those related to clean water and sanitation, and the protection of life below water.

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Methodology for Imputation of the Irish Soil Permeability Map

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The Geological Survey of Ireland (GSI) subsoil permeability map in Ireland is divided into three categories: 'High', 'Moderate' or 'Low'. Large parts of rural Ireland are not mapped, however. Many of these missing areas are located along the coast.

According to the 2022 Irish Census, about 25% of domestic houses have Domestic Waste Water Treatment Systems (DWWTSs). Most of the DWWTSs are in rural areas. DWWTSs discharge treated effluent into the groundwater in Ireland. Planning and Development Regulations as well as the EPA Code of practice for DWWTSs, require that a site suitability assessment be carried out for every proposed DWWTS. Percolation tests are carried out as part of the site suitability assessment. This test determines the rate of water absorption into the ground or percolation value.

Planning application information in Ireland is open-source information. As part of a site suitability assessment a Site Characterisation Form is filled out. This form has been in a consistent format since 2016. Approximately 40,000 planning applications which contain a Site Characterisation Form have been submitted since 2016. It is proposed to use a machine learning algorithm to extract the percolation value and location from these reports. By correlating the extracted percolation value with the field saturated hydraulic conductivity (k_{fs}) it is proposed to update the Irish soil permeability map. The updated map will be verified with field data from select sites.

Changing climate directly affects the natural replenishment of groundwater through changes in precipitation and infiltration from surface waters. The GSI groundwater recharge map is dependent on many inputs including subsoil permeability. An updated subsoil permeability map would input into not only the Groundwater Recharge Map but the Groundwater Vulnerability Map and Flood Mapping also.

Extraction Method Determines Bioaccessibility and Immunomodulatory Potential of Ficus carica Leaf Polyphenols

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Fig leaves represent an underutilised by-product of the agricultural sector, especially in the Mediterranean region, with high potential for valorisation through the recovery of bioactive phenolic compounds they contain. The present study investigates the optimisation of ethanol-based Solid-Liquid Extraction of phenolics from fig leaves, focusing on environmentally mild processing conditions. The effects of temperature (25-50 °C), pH (3-7), and extraction time (1-60 minutes) on extraction yield, total phenolic content (TPC), antioxidant capacity, and individual phenolic compounds were evaluated. Extraction performance varied significantly with processing conditions, with very short extraction times and room temperatures proving particularly effective. Maximum extraction yield (36.8%) and TPC (37.4 mg_{GAE}/g_{DW}) were achieved at 25 °C, pH 5, and 1 minute, highlighting the efficiency of a simple, rapid ethanol extraction. Antioxidant capacity ranged from 203.6 to 750.0 mg_{TEAC}/ g_{DW}, while HPLC analysis confirmed the presence of key phenolics, with their concentrations strongly influenced by pH and temperature. The results show that the ethanolic mixture enables efficient, quick, and low-energy phenolic recovery, widening the pool of sustainable extraction for industrial food and nutraceutical applications, without requiring complicated equipment and efforts. This work contributes to sustainable biomass valorisation, showing how the different extraction conditions impact the recovery of the compounds of interest and supports the circular economy through the development of a scalable and eco-friendly extraction.

Healing attempts of *Pinna nobilis* individuals using phytotherapy.

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The fan mussel, *Pinna nobilis*, is a bivalve endemic to the Mediterranean Sea. Since 2016, it experienced a catastrophic mass mortality event (MME), leading to the collapse of the majority of its populations and its subsequent classification as Critically Endangered by the IUCN. A significant challenge in the recovery of the species is the persistence of multiple pathogens linked to these high mortality rates in the wild. Specifically, *Haplosporidium pinnae*, *Mycobacterium* spp., and a picornavirus (*PnPv)* -which targets hemocytes and induces systemic immunosuppression-, are frequently detected. Currently, surviving individuals are largely restricted to paralic environments, where physicochemical water parameters diverge from open Mediterranean conditions. This restricted distribution and low abundance severely constrains both the survival of the species and the availability of specimens for conservation research.

Under the framework of the LIFE PINNACARE Project (LIFE24-NAT-ES-PINNACARE/101216239), the primary objective is the controlled reproduction of the species. However, success depends on the availability of non-immunosuppressed individuals. Consequently, a key goal of this European project is to identify effective therapeutic treatments for captive individuals to promote healing and immunostimulation.

Following a preliminary study, a therapeutic trial based on phytotherapy was implemented. This approach utilizes herbal medicinal products containing bioactive compounds with demonstrated biological activities, including immunostimulatory, growth-promoting, and antimicrobial properties against protozoa, bacteria, and viruses. The experiment aimed to evaluate the immunostimulation of specimens maintained in our facilities. The trial was conducted using 14 *P. nobilis* specimens; 10 sourced from the Thau Lagoon (France) and 4 from the Ebro Delta (Spain), over two intermittent four-week periods. The medication was administered daily via the diet, consisting of *Isochrysis galbana*; specifically, 10 individuals received the phytotherapeutic treatment, while the remaining four served as the control group. Hemolymph samples were collected at the beginning and end of each treatment period to monitor physiological status. Samples were fixed in 2.5% glutaraldehyde for cytological examination and preserved in RNAlater for molecular pathogen screening.

Throughout the trial, the filtration rate was monitored weekly as a proxy for metabolic activity, and pseudofeces were collected (whenever feasible) for a more continuous pathogen screening. The experiment was conducted under controlled open-circuit (flow-through) conditions with a continuous feeding regime, ensuring uninterrupted exposure to the phytotherapeutic treatment.

Transcriptome analysis of neural and gonadal tissues of *Pinna nobilis* Linnaeus, 1758 and *P. rudis*

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The genus *Pinna* in the Mediterranean Sea includes two species, *Pinna nobilis* and *P. rudis*. Among them, *P. nobilis* is endemic to the region and stands out as the largest bivalve. Since 2016, this species has been devastated by a mass mortality event that spread throughout the Mediterranean, wiping out approximately 99.9% of its population. To support ongoing conservation efforts and improve knowledge about the species, researchers conducted transcriptome analyses of the gonads and ganglia of mature individuals of both *P. nobilis* and *P. rudis*. mRNA was extracted, converted into cDNA, and sequenced using the BGISEQ-500 platform. Sequences were annotated, gene functions assigned (GO), and expression levels (FPKM) calculated. Differentially expressed genes (DEGs)were identified and analyzed through GO and KEGG enrichment. RNA-seq of ganglia and gonads from *P. nobilis* and *P. rudis* produced high-quality data (~46.4M reads, 97.7% clean). Results showed clear transcriptomic differences between species and tissues. In gonads, affected processes included regulation, stimulus response, and signaling, with pathways related to signal transduction, transport, and immune/endocrine systems. Ganglia showed stronger differences, with more DEGs and additional enrichment in translation and amino acid metabolism. At the gene level, gonads upregulated calsequestrin 1 and RNA helicase A, and downregulated ubiquinol–cytochrome c reductase and EF1-α; in ganglia, EF1-α and histone H2B were upregulated, while ribosomal protein L24e was downregulated. Differences between species are present in both tissues but are more pronounced in nervous tissue, particularly in protein production and metabolism, while gonadal differences mainly involve cell communication and regulation. These findings highlight potential adaptive physiological and neural differences between the species. Importantly, the results offer valuable molecular information that can support conservation efforts, including the development of captive breeding programs and reproduction strategies for the critically endangered *P. nobilis*.

Multidisciplinary oceanographic research in coastal ecosystems: análisis of biological, physical and chemical data

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The northeastern coastline of Calpe (Alicante, Spain), sheltered by the Peñón de Ifach Natural Park, hosts marine ecosystems of exceptional ecological value within the western Mediterranean basin. This study presents a multidisciplinary oceanographic characterisation of the northern sector of Peñón de Ifach, conducted between 4–8 May 2026, providing the scientific baseline required to support the municipality's candidacy for Smart Sustainable Coastal City recognition under the ITU FG-SSC framework.

Eleven sampling stations were surveyed using snorkel transects, Van Veen grab sampling, a multiparametric probe (JFE Advantech AAQ 171/172), a CTD profiler (JFT Advantech ACLW2), an echosounder, and a wave and tide recorder deployed on a mooring. Water column data were processed using the TEOS-10 thermodynamic equation of state via the Python gsw library. Laboratory analyses included chlorophyll a determination following the Jeffrey & Humphrey (1975) spectrophotometric method, colorimetric nutrient quantification, and dry-sieve granulometric analysis processed with GRADISTAT.

Representative benthic communities were identified, including *Posidonia oceanica* meadows with *Cymodocea nodosa*, photophilous infralittoral algal communities under calm hydrodynamic conditions, muddy detrital bottoms, and sciaphilous assemblages associated with the rocky substrate of the Peñón. Water column profiles showed conservative temperatures near 19 °C, absolute salinities of ~37.65 g/kg, dissolved oxygen saturation between 98–103%, and chlorophyll around 0,25 µg/L, consistent with the oligotrophic character of the western Mediterranean in the spring transition period. Seasonal comparison with an October baseline revealed marked differences in thermal stratification and oxygen saturation, reflecting the typical temperate seasonal cycle. Sediments across the beach profile and offshore stations were dominated by well-sorted fine sands, with distribution patterns consistent with moderate-energy coastal dynamics modified by artificial beach nourishment.

Results confirm a structurally complex benthic system, driving our efforts to implement policies that protect these communities. Consequently, our proposal accelerates Calpe's transition into a smart, sustainable coastal city through citizen science. Developing an app which uses AI-assisted image recognition and geolocated tracking, citizens will record marine species and coastal conditions. This crowdsourced data builds a robust biodiversity database, enabling scientists and local authorities to monitor ecosystem shifts, detect environmental impacts, and support sustainable coastal management.

CABALGA II: Innovative and inclusive approaches for the recovery and conservation of benthic communities in the Mediterranean, Atlantic and Cantabrian Seas

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Reducing the impacts of fishing on Vulnerable Marine Ecosystems (VMEs) has become a major priority and urged by FAO (UN). These ecosystems, often dominated by gorgonians, seagrass meadows, and kelp forests, provide essential services, including habitat, food resources, and nursery grounds for many commercially important species. However, increasing human pressures threaten their conservation and reduce associated biodiversity.

In this context, CABALGA II builds on the original CABALGA initiative to mitigate the impacts of small-scale fisheries on VMEs through targeted actions on gorgonians, *Posidonia oceanica*, and *Laminaria* forests, while promoting more sustainable fishing practices and ecosystem use. The project is now being implemented in Galicia, Formentera, Asturias, Catalonia, and the Valencian Community covering Mediterranean, Atlantic, and Cantabrian regions.

The approach focuses on recovering benthic organisms accidentally caught by small-scale fishing nets, which are transferred to aquaria in fishers' guild facilities. A collaborative and inclusive work involving technical staff with intellectual disabilities and scientists, is conducted to recover organisms' health before being returned to the marine environment by the fishers.

CABALGA II is funded on the former CABALGA project that conducted successful actions across more than 73 hectares with reintroduction of 820 gorgonians, 3,946 *Posidonia oceanica* shoots, and 1,789 kelps. It also incorporated underwater robotics for scientific monitoring and involved 25 people with intellectual disabilities. CABALGA II consolidates this replicable model of participatory intervention for VME conservation, integrating science, ocean literacy, innovation, and social inclusion to mitigate fishing impacts while supporting the long-term maintenance of ecosystem functioning and services.

From jellyfish bycatch to marine collagen: circular bioeconomy opportunities for small-scale fisheries

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Jellyfish bycatch is an increasing concern for small-scale fisheries, as it can increase operational costs and generate biomass with little or no commercial value. However, jellyfish are also emerging as a relevant source of marine collagen for biotechnological applications. Within the COLMED project, researchers and small-scale fishers worked together to explore whether jellyfish bycatch could be valorized for collagen production within a circular bioeconomy framework. Specifically, the study aimed to: (1) explore fishers' perceptions and willingness to participate in valorization initiatives; (2) characterize jellyfish bycatch in terms of occurrence and species composition; and (3) assess the structural and molecular quality of collagen obtained from bycatch specimens.

Fishers from four small-scale fishing guilds in Catalonia and the Valencian Community, in the Spanish Mediterranean, participated in the study through semi-structured interviews, collaborative monitoring of jellyfish bycatch, and specimen collection. The results showed high fisher engagement and a positive attitude towards jellyfish valorization, although the development of this approach still depends on greater institutional support, technical capacity and specific training. A 13-month monitoring period generated the first quantitative baseline for jellyfish bycatch in the study area, identifying *Rhizostoma pulmo* and *Pelagia noctiluca* as the dominant species. Collagen extracted from *R. pulmo* specimens obtained as bycatch retained its molecular and structural integrity. SDS-PAGE, FTIR, and XRD analyses confirmed the presence of characteristic type I collagen bands, conserved amide groups and a native triple-helical structure, all of which support its potential for future applications.

Overall, these findings indicate that incidental jellyfish catches can be converted into a valuable marine bioresource. The study also highlights the potential of participatory marine research to connect fisheries sustainability, ocean literacy, and circular bioeconomy strategies, while creating new opportunities for resilient and diversified small-scale fisheries.

First results of characterization of the impact of microplastics on Mediterranean temperate corals.

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Nowadays, microplastics (MP) are one of the most significant problems affecting marine environments. With the widespread use of plastics for both domestic and industrial applications, the presence of this type of pollutant in the sea is likely to continue to increase in the short to medium term. The presence of MP in the world's seas is widely documented, and several areas with higher levels of pollution have been identified. These include the Mediterranean Sea, which, due to its conformation and importance in global trade, is subject to a high impact.

Most of the available studies, which have mainly focused on tropical corals, indicate that MP can be ingested by corals, leading to accumulation, oxidative stress and reduced calcification, although this does not always affect their feeding capacity. Some species are able to expel the particles, but in other cases negative effects on the organisms' overall fitness have been observed. It is extremely important to study and assess the impact that MP have on the organisms and communities of Mediterranean Sea, because there is a lack of knowledge compared to other parts of the world.

The present study seeks to assess the possible impact that MP may have on two of the most common mediterranean corals, *Leptopsammia pruvoti* and *Parazoanthus axinellae*. The first is a solitary scleractinian coral that usually lives in coralligenous environments or in the tops of small crevices or caves. The second is a colonial zoanthid, typical of hard bottoms and often associated with sponges. The aim of the study was to compare the populations of these two species present at different points along the Valencian coast (Comunidad Valenciana, Spain). The areas were chosen according to their proximity to protected areas or more tourist and industrial areas, in order to have sites with a distinct presence of MP. Once the coral samples were obtained, they were processed by alkaline digestion to extract the MP from the tissues of the organisms and then filtered and observed under an optical microscope to obtain a particle count per individual/colony. They were also weighed beforehand to obtain a measure of the quantity of MP standardized on wet weight, which is particularly useful in the case of the colonial species such as *P. axinellae*. The results obtained from this research will be useful in providing an initial overview of how these two species respond to the presence of microplastics in the environment.

Impacts of offshore wind farm construction on grey and harbour seals in the *Baie de Somme* (English Channel)

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Offshore wind energy is expanding rapidly in France, which raises the need for a better understanding of the potential impact of construction activities on coastal life. This PhD's goal is to investigate how the construction of the Dieppe Le Treport offshore wind farm may have affected the movement, behaviour and activity pattern of two pinniped species using the *Baie de Somme* (France): grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*). Telemetry data was collected from 43 individuals over a mean period of 105 days (95% CI: 87-123 days). with 25 seals tracked during a pre-construction period in 2019/2020 and 18 seals tracked during the construction period 2024/2025. Every seal was equipped with GPS/GSM tags, recording among other things, fine-scale location, haul-out, and accelerometry derived information like prey capture attempts (PCA). The first step of this PhD consisted in correcting and imputing incomplete accelerometry derived data from the construction period. For that, we used a Bayesian framework to implement the missing values using Stan, models were fitted separately for each species in order to account for expected differences in behaviour and habitat use. Preliminary results showed species-specific behavioural patterns, with significant individual variability in both hunting probability and intensity. These analyses are now being extended to compare pre-construction and construction periods and to assess whether offshore wind farm construction is associated with changes in dive behaviour and habitat use. We found that construction-related patterns differ from those observed during the pre-construction period.

Microplastic Generation from the Leading Edge of Offshore Wind Turbine Blades: An Emerging Environmental Concern

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Plastic emission is one of the biggest environmental challenges caused by human activities. The statistics have revealed that the amount of plastic releasing into ocean is increasing significantly. For example, the rate was 11 million tonnes in 2016, and it will rise to 29 million tonnes by 2040. Among the plastic pollutants, microplastics are the most dangerous as they have harmful effect not only on human health but also on marine ecosystem. Wind sector is one of the most promising solutions for mitigating greenhouse gas emission. However, the offshore wind farms can release microplastics into the ocean, so they should be assessed from this prospective. The main source of microplastic emission in wind turbines is leading edge erosion of blades. This is because leading edge is exposed to harsh environment while operating at high speeds, which results in the detachment of microplastic debris from this section. This is not only an important issue as an environmental concern but also important as the aerodynamics of wind turbine is affected and energy production will be reduced while increasing the costs of repair. To address this problem, various coating materials are suggested. In the present research we developed a test chamber which simulates the offshore condition for coating of wind turbine blades. To evaluate the erosion resistance, durability, and plastic emission of coating materials we applied several types of coatings in standard laboratory condition and some were applied inside the offshore simulation chamber. Hardness, surface roughness, rain erosion, weight loss, and cavitation testing were carried out to assess the coatings. The results showed that repairing coatings under offshore conditions can considerably increase microplastic emissions by up to 120 times higher than the original coating samples. While the standard laboratory samples generate relatively low amount of microplastics per blade, repaired systems in offshore setting can become a hazardous source of microplastics as turbine sizes continue to increase. These findings suggest that developing more durable coating materials with longer service lifetimes may be a more environmentally sustainable approach than repeated repair processes.

Environmental Drivers of Gilthead Sea Bream Holobiont: Integrating Growth Performance, Blood Biochemistry, Gene Expression and Multi-Compartment Microbiota under Temperature and Salinity Variation.

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The increasing impact of environmental variability driven by climate change poses significant challenges for aquaculture sustainability, particularly in marine species such as gilthead sea bream (Sparus aurata). This study presents an integrative framework to evaluate the effects of temperature and salinity variations on the gilthead sea bream holobiont, including host growth performance, blood biochemical parameters, intestinal gene expression profile and multi-compartment microbiota dynamics.

Experimental trials were conducted at the research infrastructure of Institute of Torre la Sal (CSIC, Spain) under controlled conditions to assess the influence of environmental stressors on fish growth and health status of the animals. Microbiota from water, skin and gut compartments were characterized using high-throughput sequencing approaches (using Oxford Nanopore long-read methods and Illumina short-read sequencing), followed by comprehensive bioinformatic processing.

The obtained results were processed using multivariate statistical analyses alongside advanced bioinformatic modelling, such as Bayesian network inference, which enabling the identification of key drivers of the holobiont response to the environmental changes. Furthermore, diversity indices (alpha and beta diversity), differential abundance analyses, and community composition metrics were used to characterize the shifts among the different microbial populations across environmental gradients.

Ultimately, this study highlighted the potential of microbiota as a dynamic biomarker of fish welfare and environmental adaptation. It also establishes a comprehensive framework for understanding host–microbiota–environment interactions and physiological response patterns, providing valuable insights to optimize aquaculture practices under changing climatic conditions.

Diagnosis of Fish Diseases with the use of Molecular Methods

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Aquaculture production is increasingly challenged by infectious diseases that impact fish health, productivity, and economic sustainability. Rapid and accurate diagnosis of fish pathogens is therefore essential for effective disease management. This study presents an integrated diagnostic approach combining classical microbiological techniques with molecular methods, developed within the framework of the Student Research Hub.

Fish samples from aquaculture settings were collected and processed aseptically from target organs such as liver, kidney, and gills. Initial screening included microscopic examination and bacterial culture to detect and isolate pathogens. Biochemical identification was performed using the automated VITEK 2 system, enabling rapid classification of bacterial isolates. Molecular analyses were conducted through DNA extraction followed by polymerase chain reaction (PCR) and real-time PCR (qPCR), allowing sensitive detection and quantification of pathogen-specific DNA.

The combined methodology enabled the identification of key bacterial and parasitic agents, including species of Aeromonas, Vibrio, and Ichthyophonus. qPCR demonstrated high sensitivity in detecting low levels of pathogen DNA, while culture-based methods confirmed the presence of viable organisms. Antibiogram analysis further supported targeted treatment strategies.

Overall, the integration of molecular and classical diagnostic tools significantly improved the speed, accuracy, and reliability of fish disease diagnosis. This approach highlights the importance of combining complementary methods to support effective health management and biosecurity in aquaculture systems.

Effects of chlorine-induced stress on physiological and biochemical characteristics of the marine diatom *Phaeodactylum tricornutum*

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Chlorine based disinfectants are widely used in water treatment processes, however residual chlorine may pose significant ecological risks in aquatic ecosystems. This is of particular concern since it can directly affect microalgae, the aquatic primary producers, causing imbalance in aquatic ecosystems. This study evaluates the impact of chlorine residues on the physiological and biochemical characteristics of the marine diatom *Phaeodactylum tricornutum*, often used as an effective biomarker in ecotoxicology research. Following preliminary screening, four chlorine concentrations (0, 0.096, 0.144, 0.192 mg/L) were selected. Cultures were maintained under controlled conditions for 10 days and cell density, photosynthetic activity (PAM fluorometry), pigment content (chlorophyll a, total carotenoids) and biochemical parameters (total proteins, antioxidant capacity, total phenolic content) were analyzed. While minimal differences were observed at the initial stage, from the second day of exposure to the stressor clear concentration-dependent effects were observed. Increased chlorine levels led to reduced cell growth and alterations in photosynthetic performance, indicating stress on the photosynthetic apparatus. The total protein content was reduced proportionally with the increase in chlorine concentration as also did the phenolic compounds. The antioxidant capacity remained stable or slightly increased between the high concentrations, while remaining at lower levels than the control. These findings demonstrate that even moderate chlorine concentrations can significantly affect microalgal physiology, emphasizing the need for careful evaluation of residual chlorine in aquatic systems and its potential ecological consequences.

Thriving in salt: Adaptive physiological and biochemical responses of *Dunaliella* sp. SKE07 to hypersaline stress

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Dunaliella is a genus of unicellular, extremophilic, green microalgae, known for its ability to thrive in hypersaline environments, as well as for its remarkable metabolic plasticity. Several autochthonous *Dunaliella* sp. strains were isolated from the Kalloni saltworks in Lesvos, Greece [1]. In the present study, strain SKE07 was investigated with respect to its halotolerance and biochemical profile. Specifically, SKE07 cultures were acclimated over several generations to salinities of 40‰, 80‰ and 120‰. Growth performance, cell viability and biomass productivity were assessed under each condition. In addition, photosynthetic capacity and pigment content (chlorophyll α, chlorophyll β and carotenoids) were evaluated. Biomass was further characterized in terms of antioxidant capacity (FRAP assay) and total phenolic content (Folin assay). To further elucidate the adaptive responses of SKE07 to high salinity, non-acclimated cultures (maintained at 40‰) were directly exposed to 80‰ and 120‰ followed by the same set of analyses. The following results are presented relative to 40‰ conditions (control). Acclimated cultures showed increased cell viability across all salinities, with a maximum increase of 53.6% at 120‰, whereas non-acclimated cultures exhibited reduced growth and viability, with a maximum decrease of 56.9% at 120‰. Biomass productivity was higher at elevated salinities (80‰ and 120‰), regardless of acclimation. High-salinity acclimated cells accumulated chlorophyll α (up to +44.5%), while non-acclimated cells showed increased chlorophyll β (+60.1%). The biochemical assays indicated enhanced phenolic content (up to +68.9%) and antioxidant capacity (up to +59.7%) in non-acclimated cultures at 120‰. These findings can serve as a steppingstone for more in-depth analyses and further research into the great biotechnological potential of *Dunaliella* sp. SKE07.

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Insights into microalgal stress adaptation: the roles of *Cr*SBD1 and *Cr*CEP2

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Climate change is an escalating global phenomenon that significantly impacts aquatic ecosystems by affecting key environmental parameters such as temperature, light intensity, and contaminant load. Microalgae, the primary producers in aquatic ecosystems responsible for approximately 50% of global photosynthetic carbon fixation, are highly sensitive to environmental fluctuations. Abiotic stress conditions - including temperature shifts, nutrient limitation, and salinity changes- often lead to increased intracellular reactive oxygen species (ROS) levels and oxidative stress.

This study investigates the molecular basis of oxidative stress responses in the model microalga *Chlamydomonas reinhardtii*, with a focus on selenium-binding protein (SBP) and its interactome. We identified *Cr*SBD1 as a regulator of early oxidative stress responses, as supported by differential growth and transcriptomic responses between wild-type and *sbd1* mutant strains under H_2O_2 treatment. Yeast two-hybrid assays revealed that *Cr*SBD1 participates in a conserved protein–protein interaction network, including, among others, Cysteine endopeptidase 2 (*Cr*CEP2). Based on this, we focused on *Cr*CEP2. A comprehensive *in silico* analysis was performed to elucidate its structural and functional properties. Three independent modeling approaches (AlphaFold, SWISS-MODEL, and D-I-TASSER) were used to predict its three-dimensional structure and identify potential ligand-binding sites. Subcellular localization analysis suggested that *Cr*CEP2 is associated with lysosomal and extracellular compartments. Comparative sequence analysis revealed conserved domains, including the characteristic GCXGGLMDXA motif, across diverse taxa. Phylogenetic analysis demonstrated that *Cr*CEP2 is highly conserved, showing minimal divergence among *Chlamydomonas* species (0.12–0.13%), moderate divergence across microalgae and higher plants (0.53–0.56%), and a divergence of 0.82% with *Homo sapiens*. Overall, this study highlights *Cr*CEP2 as a promising candidate in oxidative stress-related pathways and provides the essential background for its future *in vivo* functional characterization.

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Mixotrophic cultivation of *Scenedesmus quadricauda* using waste frying sunflower oil: effects on growth and physiological response

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The generation and management of waste frying oil has long been an environmental concern, as large quantities are continuously produced both in the food service sector and at household level. This waste is often improperly discarded, particularly through drainage systems, contributing to environmental pollution. Therefore, the development of more sustainable strategies for its valorization and resource recovery remains an important objective. In the present study we explore the use of waste frying sunflower oil (WFSO) as a substrate for the mixotrophic cultivation of *Scenedesmus quadricauda*, to evaluate its potential for biomass production and physiological response under stress. Six different culture conditions were applied: a nutrient-rich control (Walne medium), a nutrient-limited control (tap water), and four treatments combining two oil concentrations (10% and 50%) with or without nutrient supplementation. Each experimental cycle lasted 10 days. Growth was monitored through daily cell counts, while photosynthetic performance was assessed using PAM fluorometry. Pigment content (chlorophyll a, chlorophyll b, and carotenoids) was determined spectrophotometrically, and additional biochemical analyses (Bradford, FRAP, Folin) were conducted to assess broader metabolic responses. The nutrient control showed an increase in cell density from ~0.1 × 10^6 to 2.6 × 10^6 cells/mL, while the low oil condition (10% with nutrients) reached similar density levels, suggesting that low oil concentrations may not inhibit growth. In contrast, higher oil concentration (50%) resulted in an initial increase in cell density, followed by a decline, indicating reduced culture stability. The observed decrease in photosynthetic efficiency further suggests that cells were physiologically affected by oil exposure. Additionally, cultures in tap water supplemented with WFSO showed improved viability compared to the tap water control, indicating that the presence of oil may support survival under nutrient-limited conditions, although not leading to sustained growth. Overall, our results suggest that *Scenedesmus quadricauda* may tolerate and partially utilize WFSO within a limited concentration range. This approach could be applied in waste management systems, particularly in the treatment or valorization of collected waste oils and in wastewater streams where oil residues are present, enabling biomass production that could be further utilized, contributing to resource recovery strategies.

Aeration systems for sustainable hydropower: protecting aquatic ecosystems in coastal river basins

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The sustainable development of urban coastal regions requires a balance between renewable energy production and the preservation of water quality. A critical challenge for hydropower infrastructure is the depletion of dissolved oxygen (DO) downstream, which severely impacts biodiversity in river-to-sea ecosystems. This study introduces an innovative aeration system designed to mitigate these ecological risks by optimizing oxygen transfer in hydropower discharge.

The proposed technology utilizes a control module that automatically switches between natural aeration (using turbine vacuum) and forced aeration (compressed air injection). By monitoring DO levels in real-time, the system ensures a minimum threshold of 6 mg/L while minimizing energy consumption. Experimental trials conducted on a Francis turbine assessed the system's impact on mechanical (vibration) and hydraulic (efficiency, power output) parameters.

Results demonstrate that the aeration process has a negligible effect on turbine performance, with efficiency variations remaining within the measurement accuracy range (±1.5%) for void fractions up to 5%. Notably, at part-load operation, the system showed potential for enhancing pressure recovery.

This solution represents a significant advancement in coastal infrastructure, offering an economically viable method to protect aquatic life and align hydropower operations with global climate change mitigation goals. By integrating this technology, energy providers can ensure the safety and quality of water bodies, supporting the sustainable management of urban and semi-urban coastal environments.

Interactive Web-Based Platform for Visualization of Operational Marine Forecasts

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The growing availability of operational marine forecasting systems has significantly improved the ability to simulate and predict hydrodynamic processes in coastal environments. However, the practical use of these datasets remains limited, as outputs are commonly stored in specialized formats that are difficult to access and interpret outside expert communities.

This study presents a web-based solution designed to bridge the gap between complex model outputs and end-user needs. The developed platform, “Hidroprognozės” (https://www.ku.lt/geo-viewer/), provides real-time access to forecast data for the south-eastern Baltic Sea and the Curonian Lagoon, with an emphasis on usability and efficient data delivery. Forecasts are generated using a finite element hydrodynamic model SHYFEM and are updated regularly to ensure up-to-date information.

Instead of focusing solely on model performance, the platform prioritizes intuitive interaction with multidimensional datasets. Users can dynamically explore spatial distributions of environmental variables (such as water temperature, salinity, currents, waves, and sea level) and investigate temporal variability at selected locations through integrated visualization tools. The system architecture is optimized for handling large geospatial datasets directly within a web browser, eliminating the need for specialized software.

The proposed approach demonstrates how modern web technologies can support wider dissemination and practical use of operational marine forecasts. By improving data accessibility and interpretability, such tools can contribute to more effective environmental monitoring, research activities, and coastal zone management practices.

Numerical simulation of wave equations using multi-relaxation-time lattice boltzmann approach

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This work presents a numerical study of wave equation simulations using the Lattice Boltzmann Method (LBM) with a Multi-Relaxation-Time (MRT) formulation. The LBM provides a mesoscopic framework for modeling wave propagation, while the MRT scheme enhances numerical stability and reduces dispersion and dissipation errors compared to classical approaches. The model is applied to linear and non linear wave equations, with particular attention given to the choice of parameters and the implementation of boundary conditions. The results are validated against analytical solutions and show good agreement in terms of wave amplitude and phase propagation. Overall, the study demonstrates that the MRT-LBM approach provides a simple, efficient, and reliable way to simulate wave dynamics. Beyond its numerical interest, this type of modeling can also help better understand wave-driven processes in aquatic environments, which are important in many environmental and coastal applications.

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CFD modelling and simulation of ammonia flow processes in internal combustion engines for zero-carbon transportation

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The present work aimed to contribute in the recent initiatives of the EU, in order to meet net-zero carbon dioxide energy production by the year 2050. The main objectives firstly included presenting an outlook of the emissions from various energy sectors with emphasis in maritime transport which affects sea, coastal and urban areas. Secondly, to demonstrate results from a marine internal combustion engine case for the reduction of CO2 levels when sustainable fuels are adopted including ammonia. The third objective was to illustrate the application of computational fluid dynamics (CFD) approaches for modelling ammonia spray injector flows, spray development, air/fuel mixing and combustion in the cylinders of automotive and marine internal combustion engines. The last objective was to formulate data-based injection models which can provide the spray angle, penetration and pattern for varying engine operating conditions, in order to setup and fully simulate engine combustion and emissions processes when ammonia fuel replaces conventional fossil fuels. The CFD methodology approach of Eulerian/Lagrangian spray modelling was adopted for the simulation of ammonia sprays at varying chamber temperature and pressure conditions. Furthermore, the Volume of Fluid (VOF) method in the Eulerian framework was employed for two-phase ammonia flow simulations in a multi-hole injector that captured internal and external ammonia flow characteristics providing jet spreading angle and breakup length. Three test fuels, namely biodiesel, bio-methanol and liquid ammonia fuels were examined. CFD simulations for increasing chamber pressure and temperature conditions were compared against published experimental data for ammonia spray penetration and ammonia droplet size distributions in constant volume chamber. The simulation results for the spray angle and penetration were further used for the development of data-based models which can be adopted for full engine flow and combustion simulations. Regression analysis on simulation data-sets provided the semiempirical data-based penetration model estimating penetration at varying chamber density as function of elapsed time after the start of injection. It was found that with elapsed time after start of ammonia injection, the emerging spray jet deflects due to interaction with gas and backflow of gas into the region of the injector nozzle tip. Also, the effects of pressure and temperature on the predicted ammonia spray were strong, and require to be further investigated.

Cellular Materials for Sustainable Protection Systems: Modelling Approaches for Reducing Environmental Impact in Coastal Logistics

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Packaging materials play an important role in protecting products. However, many packaging materials are not environmentally friendly and they can increase long term pollution. In other words, many polymers that are used in packaging systems are non-biodegradable. Therefore, they can remain in the environment for long periods after disposal. This can increase pollution in the environment, including in coastal and marine areas. For this reason, developing more sustainable materials is a societal imperative. The materials based on bioplastic show potential to be a sustainable alternative due to their lower environmental impact and biodegradability. However, their mechanical performance compared to conventional materials is not yet fully studied. By using more efficient materials, optimising structural behaviour, and improving the design, it is possible to reduce material usage while maintaining or even improving protection performance. This can lead to less waste generation and lower environmental impact. Cellular materials have attracted significant attention in recent decades. They are widely used in applications that require efficient energy absorption, structural protection, and thermal insulation due to their lightweight structure and multifunctional performance. The mechanical behaviour of cellular materials under compression consists of three regions: firstly, an initial elastic region, then a plateau region due to cell collapse, and finally a densification stage where the structure becomes compact. This behaviour enables cellular materials to absorb a large amount of energy while they remain lightweight. The parameters, such as cell geometry and relative density, have a strong effect on their overall performance. Therefore, studying the relationships between structure and properties is important for material design. In this work, multiphysics modelling approaches are explored to undertake preliminary investigations into the mechanical behaviour and structural response of cellular biomaterials. Numerical simulations will be used to analyse the effect of structural characteristics on the mechanical performance of cellular materials under compressive load, and to analyse deformation behaviour and energy absorption capacity of the biomaterial. The results will support biostructure-optimisation that can provide efficient protection and reduce material usage. Overall, the results of this study will provide useful insights for incorporating foamed structures made from sustainable materials into packaging technologies. Enhanced cellular biomaterials will lead to a reduction in the volume of necessary packaging, which will directly contribute to reduced environmental impacts in coastal and marine environments.

A STEM-Based Approach to Modeling Wave–Structure Interaction in Coastal Engineering Education

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Coastal regions are increasingly exposed to dynamic environmental forces, particularly wave action intensified by climate change, rising sea levels, and extreme weather events. These phenomena significantly affect the performance and durability of coastal protection systems, such as seawalls, breakwaters, and revetments. Understanding and accurately modeling wave–structure interaction is essential for designing resilient infrastructure capable of withstanding such complex loading conditions.

This study proposes an interdisciplinary educational framework that integrates mechanical and mathematical modeling of wave–structure interaction into engineering education. The approach is based on a case-based learning scenario in which students analyze the behavior of coastal protection systems subjected to wave- induced loads. The framework combines principles of fluid mechanics, structural mechanics, and applied mathematics to provide a comprehensive understanding of the interaction between hydrodynamic forces and structural response.

Students develop simplified mathematical models to describe wave pressure distribution and dynamic loading on coastal structures. These models are derived using fundamental equations of fluid motion and force balance, allowing the estimation of wave-induced forces under varying environmental conditions. Mechanical analysis is employed to evaluate structural response, including stress distribution, deformation, and stability criteria. Parametric analysis is incorporated to investigate the influence of key variables such as wave height, wave period, and structural geometry on system performance.

The educational methodology emphasizes active learning through modeling, simulation, and interpretation of results. Students are encouraged to explore different design scenarios and assess the effectiveness of various coastal protection strategies. Computational tools are used to support the analysis, enabling students to visualize system behavior and compare alternative solutions under realistic conditions.

The implementation of this approach demonstrated significant improvements in students' understanding of complex dynamic systems and their ability to integrate theoretical knowledge with practical applications. Students developed enhanced competencies in mathematical modeling, mechanical reasoning, and engineering decision-making. Additionally, the framework increased awareness of sustainability and resilience considerations in coastal infrastructure design.

The proposed approach contributes to the development of interdisciplinary skills and supports the design of efficient, safe, and sustainable coastal protection systems.

Modeling and Optimization of Coastal Structural Systems Using Mathematical and Mechanical Approaches in Engineering Education

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Coastal regions are increasingly exposed to environmental risks such as erosion, flooding, and extreme weather events, which place significant demands on the design and performance of protective structural systems. Engineering solutions in these contexts require the integration of mechanical principles with mathematical modeling and optimization techniques to ensure both structural resilience and sustainability.

This study proposes an interdisciplinary educational framework that combines mathematical and mechanical approaches for modeling and optimizing coastal structural systems within engineering education. The approach is implemented through a case-based learning scenario in which students analyze and design coastal protective structures, such as seawalls and retaining systems, subjected to environmental loads including hydrostatic pressure, wave action, and soil interaction. Students develop simplified mechanical models based on equilibrium conditions, material behavior, and structural resistance, which are further integrated into optimization frameworks. Mathematical techniques, including linear and parametric optimization, are used to identify optimal design configurations that balance structural safety, material efficiency, and economic cost. Constraints are defined according to engineering design criteria, safety factors, and environmental regulations, allowing students to explore feasible and efficient solutions.

The methodology emphasizes active learning, combining theoretical instruction with practical modeling tasks and computational implementation. Students are required to formulate mathematical models, interpret mechanical behavior, and evaluate the impact of design decisions under varying environmental scenarios. Sensitivity analysis is also incorporated to assess the influence of key parameters such as load intensity and material properties on structural performance.

The implementation of this approach demonstrated significant improvements in students' understanding of the relationship between mathematical modeling and mechanical behavior. Students developed enhanced problem-solving skills, improved ability to integrate interdisciplinary knowledge, and increased awareness of sustainability challenges in coastal engineering.

The findings highlight the effectiveness of combining operations research and mechanics in engineering education. The proposed framework supports the development of analytical, technical, and decision-making competencies, preparing future engineers to design resilient and sustainable coastal infrastructure systems in response to evolving environmental challenges.

Linear Programming Applications for Optimizing Coastal Waste Management Systems in Engineering Education

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Coastal urban environments are increasingly confronted with complex waste management challenges driven by rapid urbanization, seasonal tourism, and the intensification of climate change effects. These pressures generate significant fluctuations in waste volumes and require efficient, adaptive, and sustainable management strategies. Addressing such challenges demands the integration of mathematical modeling and optimization techniques capable of supporting data-driven decision-making processes.

This study proposes an educational and analytical framework that incorporates linear programming (LP) into engineering education for optimizing coastal waste management systems. The approach is structured as a case-based learning scenario in which students model a coastal city characterized by variable waste generation rates and constrained infrastructure capacities. The primary objective is to minimize the total operational cost and environmental impact associated with waste collection, transportation, recycling, and disposal.

The developed LP model includes decision variables representing waste flows across the system, while constraints reflect real-world limitations such as vehicle capacity, recycling facility throughput, landfill restrictions, and environmental regulations. The objective function integrates both economic and environmental criteria, enabling students to explore optimal allocation strategies under competing priorities. The model also supports sensitivity analysis, allowing students to examine how changes in parameters, such as increased tourism or stricter environmental policies, affect system performance.

The methodology combines mathematical modeling with active learning strategies, encouraging students to formulate optimization problems, implement solutions using computational tools, and interpret results in the context of sustainability indicators. The results of the educational implementation demonstrate significant improvements in students' analytical thinking, problem-solving skills, and ability to apply mathematical tools to real-world environmental challenges. Students developed a deeper understanding of trade-offs between cost efficiency and ecological impact, as well as enhanced competencies in systems thinking and decision-making.

The findings confirm that integrating operations research techniques into engineering education provides both pedagogical and practical value. The proposed framework is adaptable and scalable, with potential applications in broader coastal sustainability domains, including circular economy strategies, smart waste systems, and resilient urban infrastructure planning.

Multi-Criteria Decision-Making for Sustainable Coastal Infrastructure Management in Engineering Education

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Coastal regions face increasing pressures from urbanization, climate change, and environmental degradation, requiring effective management strategies for sustainable infrastructure development. Decision-making in such contexts is inherently complex, involving multiple and often conflicting criteria, including economic cost, environmental impact, technical feasibility, and social acceptance. Addressing these challenges requires structured and quantitative approaches capable of supporting informed and transparent management decisions.

This study proposes an educational framework that integrates multi-criteria decision-making (MCDM) methods into engineering education for sustainable coastal infrastructure management. The approach is implemented through a case-based learning scenario in which students evaluate alternative infrastructure solutions, such as conventional coastal protection systems and nature-based solutions. The decision- making process incorporates multiple criteria, including construction and maintenance costs, environmental sustainability, resilience to climate change, and long-term performance.

Students apply mathematical decision models, including weighted scoring methods and analytic hierarchy processes, to rank and select optimal solutions under different scenarios. The methodology emphasizes the definition of criteria weights, normalization of indicators, and interpretation of results, enabling students to understand the trade-offs involved in real-world infrastructure management. Sensitivity analysis is also incorporated to assess the robustness of decisions under varying assumptions and priorities.

The educational implementation demonstrated that students developed improved competencies in decision-making, critical thinking, and interdisciplinary problem- solving. They showed an enhanced ability to integrate quantitative analysis with managerial considerations and to justify decisions based on multiple sustainability indicators. The approach also fostered awareness of the complexity of coastal infrastructure management and the importance of balancing technical, environmental, and social factors.

The findings confirm that integrating multi-criteria decision-making methods into engineering education provides both pedagogical and practical benefits. The proposed framework supports the development of future engineers capable of making informed, data-driven decisions in complex and uncertain environments. Moreover, it contributes to the promotion of sustainable coastal development by equipping students with the tools necessary for effective infrastructure management and strategic planning.

Understanding Sustainable Travel Intentions in Regional Aviation: Behavioural Constraints and the Theory of Planned Behaviour

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Coastal regions are increasingly vulnerable to environmental pressures, climate change, and unsustainable tourism practices. While infrastructure and technological solutions are essential, understanding consumer behaviour is critical for promoting sustainable choices that reduce environmental impact and support community resilience.

This research examines the formation of sustainable air travel intentions within short-haul regional aviation, with a particular focus on Leisure and Visiting Friends and Relatives (VFR) travellers in coastal and regional contexts. Unlike much existing aviation sustainability research, which has concentrated on long-haul or discretionary travel, this study addresses air travel that is socially embedded, regionally necessary, and often structurally constrained.

Drawing on the Theory of Planned Behaviour (TPB), the research investigates how attitudes, subjective norms, perceived behavioural control, belief-based measures, and past behaviour influence sustainable aviation intentions. A mixed-methods approach was employed, combining quantitative survey data with qualitative focus group insights to explore both the statistical predictors and lived experiences associated with sustainable travel decision-making. Multivariate statistical analysis was used to evaluate the predictive power of the core TPB constructs and to examine moderating effects across travel type, gender, and dwelling.

The findings identify perceived behavioural control as the strongest determinant of sustainable aviation intention, significantly outperforming attitudes and subjective norms. This suggests that travellers are more strongly influenced by perceptions of feasibility, accessibility, affordability, and infrastructural support than by moral obligation or social pressure. Normative influences demonstrated limited explanatory power, while aggregated belief-based measures showed weak predictive capacity despite convergent validity with direct TPB constructs. The inclusion of past behaviour provided only marginal improvements in explanatory power, indicating that habitual engagement in air travel stabilises behavioural intention without substantially enhancing predictive accuracy.

Reimagining Coastal Sustainability Education: Digital Pedagogical Design for Transitions in Blue Tourism

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Blue tourism refers to a range of coastal and marine-based activities, including beach recreation, water sports, coastal cruising, and marine wildlife experiences. It is a key component of the blue economy, involving the sustainable use of ocean resources to support economic development, livelihoods, and ecosystem health. However, translating these ambitions into practice requires new forms of learning and capacity-building across diverse stakeholder groups.

Reimagining coastal sustainability education enables educators to incorporate intentional planning and effective digital learning into course design. This approach structures learning experiences that leverage digital technologies, integrate theory with practice, and enhance engagement. Moving beyond simple digitisation, digital pedagogical design emphasises interactive, collaborative, and inclusive environments across online, hybrid, and blended contexts.

This practice paper explores the development of a coastal sustainability education programme informed by digital pedagogical design. It reports on a short fully online micro-credential developed through the SEALabHaus Interreg Atlantic Area Programme, targeting educators, tourism stakeholders, and community actors across Atlantic regions. The course leverages the New European Bauhaus (NEB) framework through digital learning experiences focused on key pedagogical affordances.

The micro-credential offers a flexible and scalable mechanism for upskilling in blue tourism sustainability. Designed using the Carpe Diem methodology, it aligns learning outcomes, activities, and assessment through an iterative co-design process. The NEB Compass is used as a guiding framework, supporting participants in translating policy concepts into locally relevant responses and developing case studies for implementation in their own contexts.

Findings highlight the potential for transnational learning, engaging over 400 learners across Europe and fostering community-driven collaboration. This work offers insight into how digital pedagogical design supports sustainability transitions in blue tourism, enabling learners to navigate complexity and co-construct actionable knowledge for sustainable coastal futures.

A blended learning model for maritime studies as a capacity-building pathway for sustainable coastal development

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Sustainable urban coastal development requires not only scientific and technological innovation, but also flexible and scalable higher education models capable of preparing maritime professionals to respond to environmental, social, and operational challenges in coastal regions. This abstract presents a blended learning approach designed for Maritime Studies, developed by rethinking the relationship between intensive face-to-face teaching and distance learning. The proposed model responds to the need for accessible, pedagogically coherent, and interaction-rich learning environments that can support diverse student populations while maintaining academic quality and professional relevance. The approach builds on two pre-existing modes of delivery: a conventional format based on concentrated in- person lectures and a distance learning format structured through a pedagogical framework emphasizing three interrelated dimensions: high-quality educational materials, dynamic online interaction, and multi-layered assessment. Rather than treating these modes as separate pathways, the proposed design integrates them into a single course of architecture delivered through one learning management system and shared teaching space. The model unfolds in three stages. First, an introductory orientation week establishes social presence, clarifies expectations, familiarizes students with digital tools and support structures, and initiates communication with instructors and peers. Second, an intensive blended phase combines face-to-face and synchronous online participation through hybrid teaching, enabling students in different attendance modes to engage with the same live learning experience. Third, an extended online phase distributes synchronous sessions across the semester and combines them with asynchronous collaborative activities, guided independent study, and continuous engagement with course materials. Across the model, assessment remains stable through assignments, collaborative activity, and final examination, ensuring continuity while supporting formative and summative learning. The significance of this work lies in its potential contribution to sustainable coastal development through education. Maritime sectors increasingly require graduates who can learn flexibly, collaborate across locations, and engage with complex coastal and marine challenges in digitally mediated professional environments. By creating a more inclusive and connected learning design, the proposed model supports capacity building for the blue economy, widens participation, and strengthens the resilience of maritime higher education. As a transferable framework, it offers a practical example of how curriculum and pedagogy can contribute to the broader socio-ecological transition of coastal communities.

Species literacy & coastal ecology: A design-based-research project on game-based science education and communication.

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To address the current global biodiversity crisis, characterized by habitat loss and dramatic species extinction rates, it is necessary to promote a literacy of biodiversity among the general public (Probst & Rupert, 2025). Species literacy is a key part in this regard. The concept goes beyond naming species by incorporating an awareness of biodiversity, broad knowledge, in-depth knowledge of specific species and taxonomic groups (e.g., habitats), as well as skills in species observation and identification (Hooykaas et al., 2019).

Species literacy influences our understanding of biological diversity and our evaluation of conservation measures (Sturm & Berthold, 2015). Furthermore, knowledge of species serves as a focal point for a deeper understanding of ecological relationships (Magntorn & Helldén, 2007).

This project develops a system that combines a digital game with different approaches to learn about species and their ecological interactions as part of in-depth knowledge. This study is part of a design-dased-research project (Reinmann, 2022) on students' ecology learning, species identification and ecological systems understanding with game based learning. Therefore a game called »seagull swoop« is created and adapted to different learning goals. The first study on the impact of the game on student motivation is already done.

Additionally different measuring methods like concept maps are evaluated to get a broader repertoire to examine species literacy as part of understanding coastal enviroments and sustainability. In future design cycles this methods should be included in the game. This is the foundation to use the game in a broader approach for science education, science communication and teacher education in germany and with european partners.

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Game-based learning of coastal ecology: An intervention study on the impact of GBL on students' intrinsic motivation

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Digital game-based learning (DGBL) is increasingly used in biology classrooms and science communication (Muenz, et al., 2023). A recent review reports a rapidly growing but fragmented field with diverse game types and a dominance of short, isolated interventions. A meta-analysis in STEM shows small to moderate positive effects of digital games on achievement and motivation, but emphasises that effects depend on careful instructional design and appropriate comparison conditions rather than on games per se (Wang et al., 2022).

The present project develops a system that combines a digital game with a flexible learning environment for coastal ecology. The study reported here is the motivational strand of a larger Design-Based-Research project (Reinmann, 2022) on students' ecology learning, species identification and ecological systems understanding. It focuses on a 90-minute secondary biology lesson on "human impacts on gull ecology" built around the digital game Seagull Swoop.

The study follows a quasi-experimental intervention design with comparison group in secondary biology classes at German comprehensive schools. N = 122 students were in classes assigned either to the game-based system (intervention) or to a comparison condition without the game but with equivalent ecological content.

Intrinsic motivation was measured with the KIM questionnaire (Wilde et al., 2009) immediately before the lesson (pre), after the first half (mid) and at the end (post). Analyses include repeated-measures ANOVAs and, where appropriate, multilevel models with time nested within students and experimental condition as a between-subject factor. Findings on pupils motivation including autonomy, competence and relatednes will be presented.

Within a DBR framework, early-cycle quantitative evaluations of intrinsic motivation provide feedback for refining design principles in later cycles that will integrate species identification tasks and assessments of ecological systems understanding.

Findings from this study will inform subsequent iterations towards a scalable ecology game-and-lesson system that can be integrated into longer teaching units and, potentially, across science communication on smart urban coast sustanability.

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Governance Intelligence for Socio-Ecological Transitions: Reflexive Decision-Making and the Role of European University Alliances

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Despite unprecedented advances in technological and scientific solutions, coastal sustainability challenges persist—revealing not a deficit of knowledge, but a failure of governance.

Contemporary sustainability challenges increasingly reveal governance failures rather than technological gaps, as decision-making remains fragmented across actors, institutional arrangements, and governance levels (Pierre & Peters, 2020; Lodge & Mennicken, 2019). Despite advances in digital and AI-enabled governance, the capacity to transform distributed knowledge into coordinated action remains limited (Floridi et al., 2018; Cath et al., 2018; OECD, 2025). This paradox reflects a systemic deficit in governance systems' ability to operate reflexively under conditions of complexity.

This paper advances the concept of Governance Intelligence (GI) as a systemic capability enabling governance systems to generate, integrate, and operationalise distributed knowledge into coherent and adaptive action. Building on governance theory, collaborative governance (Ansell & Torfing, 2021), and meta-organisational perspectives, the study argues that sustainability transitions depend on the capacity of governance systems to move beyond fragmented coordination toward integrated decision-making.

Coastal sustainability challenges are conceptualised as complex adaptive systems, in which small misalignments in decision-making can produce cascading and non-linear effects across environmental, social, and institutional domains. In such contexts, linear governance approaches fail to capture interdependencies, feedback loops, and emergent dynamics. Governance Intelligence addresses this gap by enabling three interrelated capacities: analytical–sensing (interpreting complex signals), reflexive–institutional (reconfiguring governance trajectories), and relational–coordinative (aligning multi-actor systems).

European University Alliances (EUA) are examined as emerging meta-organisational governance systems that can act as catalysts for socio-ecological transitions. As transnational collaborative structures integrating academia, industry, and society, alliances possess unique capacities to mobilise knowledge, educate future decision-makers, and co-create solutions across sectors. However, existing research indicates that such alliances operate under conditions of projectification, fragmented coordination, and organisational memory fragility, which may limit their long-term integrative capacity.

By bridging governance theory and higher education policy, this paper contributes to understanding how governance systems can move from fragmented coordination toward integrated, reflexive, and intelligence-enabled decision-making. It argues that ***smart, urban, coastal, sustainable*** development depends not only on technological solutions, but on the capacity of governance systems to function as coherent and adaptive systems.

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SRH - Biodiversity survey and interpretation assessment of Copper Coast UNESCO Global Geopark in Co. Waterford, Ireland.

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Ireland has three UNESCO Global Geoparks these are single, unified geographical areas where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. The Copper Coast UNESCO Global Geopark is located along the South East coast of Co. Waterford. The coastal cliffs and beaches show 460 million years of geological heritage, with a glacial outwash plain inland containing a range of protected plants and habitats. The objectives were to develop critical evaluation skills for sustainability practices, evaluate the copper coast biodiversity and evaluate the environmental interpretation activities, while conducting biodiversity assessments and surveys as part of a team, and translating theoretical knowledge into practical solutions and recommendations for improvements where necessary. For the fieldwork a section of the Geopark was chosen from Bonmahon to Annestown including the Anne Valley (approx 8km). An evaluation was carried out on the current range of environmental interpretation available to locals and visitors. The tools used were Dr Sam Ham's TORE model (thematic, organised, relevant, entertaining) and a SWOT (strengths, weaknesses, opportunities, threats) analyses, and FRYs readability test, to evaluate the interpretation in the visitor centre, the tour guide and the Bonmahon Geological Park. For the biodiversity surveys, FIT counts, Botanical keys, Fossitts habitats classification, quadrats and camera traps were utilised. By engaging with real-world applications of sustainability and interpretation students gained a deeper understanding of the human impact on the environment. They better understand the importance of allocating protection to enhance our biodiversity in sensitive environments.

SRH - Applications of computational fluid dynamics (CFD) and computational mechanics (CM) for sustainable and secure transport systems at coastal and urban areas – Outcomes and Prospects

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The main objectives of the present Student Research Hub (SRH) firstly included the development of multidiscipline engineering skills for formulating problems and reaching practical solutions. The second objective was to apply engineering design for problem geometry and boundary conditions definition, as well as comprehend computational approaches for modelling, calculation and simulation for tackling problems of energy, emissions and transport safety mechanics. The final objective was to acquire skills for data analysis, visualization and presentation through the preparation of individual projects by each participant, in order to synthesize geometry and computational data for problem solution presentation suggesting improvement solutions. The present SRH of EU-CONEXUS WP7 “Research to Education” was delivered by Frederick University (FredU) during the Fall 2025 Semester. The present SRH training offered undergraduate and masters students theoretical knowledge and practical skills, with emphasis in three-dimensional design, computational methodologies and analyses (fluid flow, turbulent with heat and mass transfer), mechanical systems behavior (mechanics, forces and stress analysis), for the investigation of sustainable structures, energy systems and environment. Participants acquired skills for internal and external flow and mechanics simulations and analysis, and practical use cases were demonstrated, accompanied with investigations and practice in three-dimensional design software (SOLIWORKS), considering all stages of system design, simulation and parametric investigation for solving real engineering problems occurring at sea, coastal and urban environments. The methodology including the constitutive equations for CFD and mechanics calculations and simulations were presented, complemented with simple examples analysis using MATLAB computer programming for results and data visualization. Specialised software including the CFD code STAR-CD and the ANSYS software for mechanics investigations were also demonstrated. Training covered in detail the design and simulation practice in SOLIWORKS, which is considered as an essential tool for professionals in engineering as well as for researchers. The outcomes of the present SRH were very optimistic and provided various high quality design and simulation projects, covering a wide range of applications spanning from food quality and safety, to automotive aerodynamics and air/fuel supply characterization to greenhouse structure analysis, and the hydrodynamics analysis/optimisation of hydrofoil for efficient shipping.

Posters
Session 3

Resilient Roadside Infrastructure for the Electric Vehicle Era: Rethinking Guardrail Performance for Future Transport Safety

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The rapid transition toward electric mobility introduces new challenges for roadside safety infrastructure. Electric vehicles differ significantly from conventional internal combustion engine vehicles in terms of mass distribution, structural stiffness, and underfloor battery architecture. These characteristics modify crash dynamics and may affect the performance of roadside containment systems originally designed for lighter vehicles. As road infrastructure plays a critical role in maintaining mobility and safety during extreme events and emergencies, ensuring the resilience of roadside barriers is an increasingly important component of disaster-resilient transport systems.

This study investigates the interaction between EV and conventional W-beam guardrail systems through numerical crash simulations performed using the finite element software LS-DYNA. A series of representative vehicle to barrier impact scenarios are modelled to evaluate containment performance, barrier deformation patterns, and occupant risk indicators under conditions comparable to EN1317 testing configurations. The simulations allow controlled assessment of how increased vehicle mass and structural rigidity influence guardrail energy absorption and redirection capability.

Preliminary results indicate that heavier EV architectures can produce higher localized loads on guardrail components, potentially increasing dynamic deflection and altering vehicle redirection behavior compared with traditional vehicle models. These effects suggest that some legacy guardrail configurations may approach their design limits under emerging vehicle conditions.

The study demonstrates how computational crash modelling can support the development of adaptive and resilient roadside infrastructure by enabling systematic evaluation of barrier designs before costly physical testing. Integrating advanced simulation tools with evolving vehicle technologies can help guide the modernization of transport safety systems, contributing to more resilient road networks capable of supporting sustainable mobility and protecting communities in hazard-prone regions.

SRH-Natural language processing (NLP) for climate research: Practical text analysis workflows

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The goal of the activity is to get students hands-on with modern natural language processing (NLP) methods applied to real climate research data. Students will read foundational material covering data processing, text embeddings, and methods like LDA and BERT for topic modelling, as well as sentiment analysis approaches using VADER and BERT models. Students will apply these concepts to their own climate dataset using Python. They will have to make choices about how to prepare the dataset for analysis, which algorithm to use, and how to optimize the model for best results. The course combines both theory and practice, and enables students to analyse public discourse on climate using recent and powerful analytical techniques. By the end of the activity, they will have developed a complete analytical pipeline, acquiring both hard (data preprocessing, text representation, topic modelling, sentiment analysis) and soft research skills (critical thinking, presenting analytical findings).

Sustainable Retrofit Strategies for Traditional Timber Houses

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Traditional timber houses are still largely spread on the Romanian territory, in both rural and urban areas. Since they are a category of buildings which can be considered eco-friendly, being composed mainly of natural materials, their strengthening and retrofit should be also considered to be in the same way.

Within the StrongPa project implemented in Technical University of Civil Engineering Bucharest, several seismic strengthening solutions were proposed and experimentally tested to find the best ones, depending on the owners' budget or interest.

The paper presents a comparison between the eco-friendly solutions and the ones using cement-based materials. A cost-effective analysis is also provided, helping the stakeholders to be informed when selecting the right solutions for their houses, also taking into account that Romania is an active seismic area.

***Keywords**: timber, masonry, vernacular, eco-friendly, strengthening*

Robot-Assisted Monitoring of Historic Buildings in Coastal Urban Environments: Innovative Solutions for the Sustainable Protection of Built Heritage

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Historic buildings in coastal cities are subject to accelerated degradation processes caused by the cumulative action of environmental factors such as humidity, saline aerosols, and temperature variations, compounded by anthropogenic pressures and the difficulties associated with the maintenance and monitoring of heritage buildings. In the municipality of Constanța, these conditions directly affect the state of conservation of historic monuments and call for the identification of innovative solutions for investigation, documentation, and support for restoration interventions. In this context, the paper examines the potential of robotics in the monitoring and assessment of historic buildings in coastal urban environments.

The study highlights the applicability of robotic systems in architectural surveying, digital mapping of spaces and surfaces, the identification of cracks and other forms of degradation, as well as the monitoring of hard-to-reach areas or zones with a high degree of risk. Particular attention is given to the possibility of using swarms of microrobots equipped with LiDAR sensors and developed on MicroROS-based architectures, capable of operating collaboratively for the collection, correlation, and processing of spatial data. Such an approach may facilitate the development of precise digital models of historic buildings, the early detection of degradation phenomena, and the support of conservation decisions based on objective and up-to-date information.

The paper is based on the premise that robotic technologies do not replace the expertise of conservation-restoration specialists, but rather constitute a complementary tool capable of enhancing the safety, accuracy, and efficiency of monitoring and intervention processes. At the same time, the study discusses the limitations and conditions of integrating these technologies into the field of built heritage, in relation to the principles of authenticity, minimum intervention, and respect for historic fabric. By relating the analysis to the specific context of the city of Constanța, the paper argues that collaborative robotics may represent a relevant direction for the sustainable protection of built heritage and for the development of contemporary conservation strategies in coastal urban environments.

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Preliminary tests on the resistance capacity of wooden elements exposed to marine environment of the Black Sea Region

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Timber elements present different mechanical and physical properties. A notable disadvantage is its vulnerability to humidity and moisture content variations. For this reason, it is essential to take into consideration the adsorption and desorption of water in order to evaluate the resistance capacities of the elements subjected to different stresses. In this study, wooden elements have been exposed to marine environmental conditions specific for the Black Sea Region in order to investigate the effect of climate factors on their mechanical resistances. Two main approaches are considered in this current paper: gathering information on the wood properties, durability, performances and changes in the load bearing capacity under the exposure conditions and experimental tests. The experimental campaign consists of using a number of specimens with the same dimensions submerged into water with different degrees of salinity before carrying out the experimental tests in bending, tension and compression. The analysis made with the results is then compared to wooden elements found in normal exposure conditions where the interior moisture content is 12%. The aim of the study is to see the influence of a specific climate found in the Black Sea area on wooden elements that are used in the construction sector.

Development of a dynamic material passports framework for sustainable and circular urban coastal construction

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Climate change, resource depletion, and environmental pressures that affect the built environment have made the transition towards sustainable urban coastal development increasingly prioritised. The construction industry has been recognised as a significant cause of material consumption, waste production, and greenhouse gas emissions, necessitating the adoption of circular economy (CE) principles and digital innovation [1, 4]. The aim of this research was to create and evaluate a system for Dynamic Material Passports (DMPs) and Digital Product Passports (DPPs) that facilitates lifecycle-based material management and sustainability in urban coastal construction [5, 6].

A mix of methods was employed to collect empirical data through twelve semi-structured interviews with industry professionals and technology providers, using a systematic literature review and gap analysis of existing Material Passport methodology. The data was analysed using thematic and content analysis to identify technical, organisational, and regulatory challenges that influence the adoption of passport-based systems [7].

According to the findings, DMPs and DPPs were widely viewed as essential tools for improving material traceability, lifecycle assessment, and circularity in construction projects. Despite this, several obstacles were identified, such as the absence of standardisation, interoperability limitations, high implementation costs, fragmented data structures, and unclear governance frameworks. In coastal urban contexts, where infrastructure resilience, environmental monitoring, and long-term asset management are essential, these challenges were of particular significance. The European Union's Ecodesign for Sustainable Products Regulation (ESPR) and Construction Products Regulation (CPR) 2024 were expected to play a crucial role in accelerating adoption, as observed [2, 3].

As a response, a DMP framework was proposed that is enhanced by BIM and AI, and incorporates lifecycle data management, real-time updates, and interoperability with standardised data structures and digital identifiers. By supporting early-stage design decision-making, verification of construction phase, and long-term operational monitoring, the framework aligns with sustainable urban coastal development objectives.

It was concluded that the implementation of dynamic, interoperable passport systems can facilitate the transition from static documentation to data-driven lifecycle management, enhancing resilience, resource efficiency, and environmental performance in coastal built environments.

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Numerical evaluation of airflow and heat exchange within lightweight wall boards equipped with interconnected PV panels

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Considering the most ambitious scenarios, it is estimated that the global photovoltaic (PV) systems will exceed 7 TW by 2030. In this context, it is expected that Building-Integrated Photovoltaics (BIPV) to develop more and more. In the case of BIPV solutions integrated in the façade, these are typically based on rain screen cladding systems using metal sub-construction and external covering made from PV panels. These systems are normally heavyweight, non-flexible and architecturally monotonous. For this reason, innovative solutions are studied for BIPV to facilitate their installation and maintenance, while achieving high efficiency, environmentally friendly and cost-effective products. As a result, the aim of this study is to numerically investigate the performance of lightweight wall boards equipped with PV panels and heat dissipation systems. This BIPV solution is based on granular form perlite panels (Verolith®) easy to shape for complex designs. This feature allows creating complex geometry of channels within the expanded perlite panels for PV electrical installation and mechanical fastens. In addition, heat dissipation canals could be easily manufactured within these expanded perlite panels to prevent their overheat in the summer and condensation issues in the winter affecting the PV system efficiency and lifetime. Consequently, our work focuses on numerically optimization of heat dissipation strategies within the BIPV system based on expanded perlite panels, considering different geometry and shapes of the channels especially created for this. The numerical approach is based on CFD (Computational Fluid Dynamics) technique using a general purpose, finite volume, Navier-Stokes solver (Ansys Fluent). As a result, a three-dimensional steady-state (full scale) CFD model for a PV wall expanded perlite panel (1210 x 542 mm) was developed considering different cooling cavity structures inside the panel. The results achieved show the impact of cavity geometry on the variation of the surface temperature of PV panels. Finally, data concerning estimations of PV panels higher energy production due to proposed heat dissipation systems are presented.

Modeling of Soil–Structure Interaction in Coastal Environments Using a STEM-Based Learning Approach

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Coastal environments are increasingly affected by complex geotechnical and environmental processes, including soil erosion, rising groundwater levels, and the intensification of extreme weather events due to climate change. These phenomena significantly influence the behavior of soil–structure interaction systems, posing challenges to the design, stability, and long-term performance of coastal infrastructure. Addressing these challenges requires an integrated approach that combines mechanical principles with mathematical modeling techniques to support resilient and sustainable engineering solutions.

This study proposes a STEM-based educational framework focused on the mathematical and mechanical modeling of soil–structure interaction in coastal environments. The approach is implemented through a case-based learning scenario in which engineering students analyze the behavior of a coastal structural system, such as a retaining wall or shallow foundation, subjected to combined loading conditions. These include hydrostatic pressure, wave-induced forces, and variations in soil properties due to saturation and erosion processes.

Students develop simplified mechanical models based on equilibrium equations, stress–strain relationships, and soil mechanics principles, including effective stress and shear strength criteria. These models are integrated with mathematical representations that allow the evaluation of structural response under varying environmental conditions. Parametric analysis is incorporated to investigate the influence of key variables, such as soil cohesion, friction angle, and water table fluctuations, on system stability.

The methodology emphasizes active and interdisciplinary learning, encouraging students to formulate mathematical models, interpret mechanical behavior, and assess system performance using computational tools. Students are also guided to evaluate safety factors and identify critical failure scenarios, enhancing their understanding of risk and uncertainty in coastal engineering contexts.

The implementation of this approach demonstrated significant improvements in students' ability to connect theoretical knowledge with practical engineering applications. Students developed enhanced competencies in mathematical modeling, mechanical reasoning, and problem-solving, as well as a deeper awareness of sustainability and resilience challenges in coastal infrastructure systems.

The findings highlight the effectiveness of integrating soil mechanics and mathematical modeling within engineering education. The proposed framework supports the development of future engineers capable of designing safe, efficient, and sustainable coastal structures.

Quantifying seismic risk and financial resilience in Bucharest through EAL, PML and Tail Risk metrics

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Bucharest is one of the most seismically exposed capitals in Europe, with significant vulnerability arising from aging building stock and concentrated urban exposure. This study aims to quantify earthquake risk and support disaster risk reduction strategies by evaluating key financial risk metrics, including Expected Annual Loss (EAL), Probable Maximum Loss (PML), and tail risk measures. A probabilistic seismic risk computation is approached, integrating hazard characterization, exposure modelling, and vulnerability functions to simulate earthquake loss scenarios. The methodology employs catastrophe modelling principles, where stochastic event sets are used to generate loss exceedance probability (EP) curves, enabling the estimation of risk metrics across different return periods. These metrics capture both average loss behaviour and low-probability, high-consequence events, which are critical for urban resilience planning and insurance applications. Such approaches are widely used in earthquake risk and insurance modelling to assess financial impacts and support risk transfer mechanisms. Preliminary results indicate that Bucharest exhibits a highly skewed loss distribution, with significant tail risk driven by rare but catastrophic Vrancea seismic events. The estimated EAL reflects persistent background risk, while PML values highlight substantial potential losses for extreme return periods, underscoring systemic vulnerability in the built environment. These findings suggest that both structural mitigation and financial instruments are necessary components of an integrated disaster risk reduction strategy. The study demonstrates how quantitative risk metrics can inform urban resilience policies, optimize insurance design, and enhance preparedness for future earthquakes. Ultimately, the study contributes to bridging engineering-based seismic risk assessment with financial risk management, supporting evidence-based decision-making for disaster resilience in Bucharest.

Risk-Based Management of Coastal Urban Systems Using Statistical and Decision Models

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Coastal urban systems are increasingly exposed to a wide range of risks generated by climate change, rapid urbanization, environmental degradation, and socio- economic pressures. These risks include flooding, infrastructure overload, pollution, and disruptions in essential services, all of which require integrated and adaptive management strategies. Effective risk-based management in coastal environments demands the use of quantitative tools capable of capturing uncertainty, evaluating multiple risk factors, and supporting informed decision-making processes.

This study proposes an educational framework that integrates statistical analysis and decision-making models for risk-based management of coastal urban systems within engineering education. The approach is implemented through a case-based learning scenario in which students analyze and manage risks affecting a coastal urban area under varying environmental and socio-economic conditions.

Students apply statistical methods, including descriptive analysis, probability distributions, and regression models, to identify and quantify risk factors such as population density, seasonal tourism fluctuations, waste generation, and exposure to extreme weather events. These statistical insights are then integrated into decision models, including multi-criteria decision-making (MCDM) approaches, to evaluate and prioritize management strategies.

The methodology emphasizes the identification of risk indicators, the quantification of uncertainty, and the evaluation of alternative scenarios. Students are required to construct risk assessment models, interpret statistical outputs, and develop decision strategies that balance economic, environmental, and social considerations. Sensitivity analysis is incorporated to assess the robustness of decisions under changing conditions and incomplete information.

The implementation of this approach demonstrated that students developed enhanced competencies in data analysis, risk assessment, and strategic decision-making. They improved their ability to integrate statistical evidence into management processes and to evaluate complex systems characterized by uncertainty and multiple interacting variables. Additionally, the approach fostered systems thinking and increased awareness of the importance of resilience and sustainability in coastal urban planning. The findings highlight the importance of combining statistical and decision models in engineering education to address contemporary challenges in coastal urban management. The proposed framework supports the development of future professionals capable of designing adaptive, data-driven, and resilient strategies for managing coastal urban systems.

Financing urban resilience: the role of crowdfunding in green infrastructure development

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The realization of infrastructure projects is frequently constrained by financing barriers [1]. In response to these challenges, alternative financing models have gained increasing attention as complementary approaches to conventional funding mechanisms. One prominent approach is the use of Public–Private Partnerships (PPPs) for the provision of both economic and social infrastructure [2]. Within this context, crowdfunding has emerged as a potential form of implementation that enables broader participation in infrastructure financing [1–3]. Existing applications of infrastructure crowdfunding range from smaller-scale social infrastructure projects, such as water supply systems, waste management facilities, and regional healthcare infrastructure, to large-scale technological infrastructures, including satellite systems [2]. A particularly promising area of application concerns the financing of green infrastructure. As climate change impacts intensify, substantial investments in infrastructure supporting climate change adaptation and risk reduction are required. However, similar to many other infrastructure initiatives, green infrastructure projects often face difficulties in securing adequate funding through traditional financing channels [3]. Against this background, this study provides a systematic overview of the existing literature on crowdfunding for green infrastructure. By synthesizing current research findings, the study aims to establish a structured reference point for this emerging field. The results indicate that crowdfunding has the potential to complement traditional financing mechanisms by broadening access to investment opportunities and enabling greater public participation in the financing of green infrastructure [3]. In doing so, crowdfunding contributes to the strengthening of urban resilience [3]. The findings are relevant for key stakeholders, including researchers, policymakers, urban planners, and community advocates.

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Bridging the Data-Policy Gap: A Framework for Leveraging Mobility Data in SDG-Aligned Coastal Urban Governance

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Abstract: In the face of accelerating climate change, urban coastal regions encounter unique vulnerabilities requiring highly adaptive governance frameworks. While the Sustainable Development Goals (SDGs) provide a global roadmap, municipal implementation often suffers from "data-policy gaps"—where decision-makers lack the granular insights necessary to optimize infrastructure and disaster response.

This research presents a methodological framework for integrating high-resolution mobility data into municipal decision-making processes. Using the University of Rostock's proximity to Baltic coastal dynamics as a contextual backdrop, the study examines how spatio-temporal flow analysis can transition from descriptive statistics to predictive governance tools. We investigate the nexus between smart mobility patterns and urban resilience, specifically addressing how data-driven insights can optimize "Nature-Based Solutions" (NBS) by modeling human-environment interactions in semi- urbanized coastal zones.

The findings demonstrate that aligning mobility metrics with specific SDG indicators (notably SDG 11 and 13) allows for a more "Smart" coastal infrastructure that anticipates disaster risks rather than reacting to them. This paper argues that the future of coastal sustainability lies not just in physical engineering, but in the "digital twin" of human mobility—enabling policymakers to simulate the impact of climate adaptation strategies on social equity and urban functionality. By positioning mobility data as a core pillar of coastal governance, municipalities can achieve more resilient, inclusive, and sustainable urban development.

Leadership styles enabling organizational ambidexterity for strategic value creation in coastal climate adaptation: the role of collaboration and local knowledge systems

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Coastal regions are increasingly exposed to complex climate-related risks, including sea-level rise, coastal erosion, and extreme weather events. These challenges require adaptive and integrated responses that combine technological, environmental, and organisational approaches. While infrastructure and nature- based solutions are widely discussed, less attention is given to leadership and organisational capabilities that enable their effective implementation. This conceptual poster examines how leadership strategies enable organisational ambidexterity for strategic value creation in coastal climate adaptation contexts.

Organizational ambidexterity refers to the ability to balance exploration (innovation and experimentation) and exploitation (efficiency and implementation), which is essential for organisations operating in dynamic and uncertain environments. Drawing on leadership and ambidexterity literature, the conference poster argues that leadership plays a critical role in enabling this balance by shaping organisational processes, fostering learning, and supporting collaboration. Different leadership approaches contribute to ambidexterity by facilitating both incremental improvements and radical innovation, which are necessary for long- term sustainability.

In coastal climate adaptation contexts, leadership also facilitates collaboration and the integration of local knowledge systems. This is essential for implementing nature-based solutions and strengthening resilience through stakeholder engagement. Leadership-driven organisational ambidexterity therefore becomes a key mechanism for enhancing adaptive capacity and supporting sustainable value creation in coastal communities.

The poster contributes to the interdisciplinary discussion on climate adaptation by introducing a management perspective that complements engineering and environmental approaches, highlighting leadership as a key enabler of resilience and sustainable development.

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Green Skills for Organizational Resilience

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The global shift toward a low-carbon economy has elevated green skills from a niche asset to a core organizational capability essential for resilience, innovation, and regulatory alignment. This abstract presents the key findings from a comprehensive survey conducted within the EU Erasmus+ Project GREAT ("Green Transition for Economics and Administrative Science Students"), which examined organizational interest, perceived importance, and readiness regarding green jobs and green competences. The study analyzed responses from 260 public and private-sector organizations across four countries: Lithuania, Spain, France, and Türkiye.

Overall, the results indicate that organizations demonstrate moderate to high engagement with sustainability, increasingly embedding environmental considerations into strategic planning and operational practices. A major driver of this engagement is the need to keep pace with legislative development and ensure regulatory compliance, which respondents identified as highly important. The findings also reveal notable differences across organizational types and regions: private-sector organizations consistently placed greater emphasis on sustainability than their public-sector counterparts, while organizations in Türkiye reported the strongest focus on sustainability relative to those in France and Spain.

Demand for interdisciplinary green competencies, particularly in innovation, risk management, and environmental impact assessment, was especially prominent. Although these skills are most essential in specialized environmental and sustainability roles, organizations increasingly recognize their relevance across broader functions, including human resources and logistics. In contrast, the current demand for green skills in sales and marketing remains comparatively low.

Looking forward, 66% of respondents anticipate a growing need for green skills within the next five years. Yet the significant labour market challenges threaten to slow this progress. Nearly half of the surveyed organizations (45%) indicated the difficulty in finding suitably qualified candidates, a challenge compounded by limited awareness of green career pathways among job seekers.

In sum, while many organizations are actively integrating sustainability into their strategic agendas, persistent talent shortages and skills gaps present substantial barriers. Addressing these challenges will require coordinated efforts in education, training, and professional development to cultivate a workforce capable of supporting the advancing green economy.

Empowering Girls in STEM as a Capacity-building Pathway for Climate Adaptation and Coastal Resilience

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In light of escalating global environmental challenges, coastal cities are increasingly exposed to climate-related risks — including sea-level rise, coastal erosion, flooding, and marine pollution — which require integrated approaches to disaster risk reduction and climate change adaptation. Addressing these challenges depends on both technological innovation and inclusive capacity building and community engagement. Social participation has been identified by the EU-CONEXUS consortium as a key pillar in strengthening the resilience of urban coastal communities, particularly through the involvement of young people.

However, girls remain underrepresented in STEM fields, limiting the diversity of perspectives contributing to the design of adaptive solutions. Increasing their participation is therefore both a matter of equity and a strategic investment in developing future professionals capable of contributing to climate-resilient infrastructure, nature-based solutions, and context-sensitive interventions informed by local knowledge and cultural practices.

In response, Frederick University has implemented a long-term initiative aimed at reducing the gender gap in STEM while raising awareness of sustainability and climate adaptation challenges. The methodology is based on inclusive, experiential, and community-engaged learning approaches, beginning with the provision of scholarships for women enrolling in the University's School of Engineering to increase female participation in STEM disciplines.

The initiative is complemented by a series of outreach actions, including hands-on STEM workshops, educational camps, and dedicated STEM Days targeting girls aged 9–16, with a focus on real-world applications such as sustainable design and ecosystem-based adaptation. It also incorporates exposure to female role models to strengthen participants' confidence and interest in STEM careers. In parallel, it offers free workshops for parents and educators addressing gender equity, confidence-building, and the reduction of stereotypes, while collaboration with industry partners and international organisations supports the funding of scholarships and the expansion of STEM initiatives.

Evaluation of the initiative is conducted using a mixed-methods approach combining participation data, enrolment trends, and qualitative feedback. Results show a significant increase in female enrolment in the University's undergraduate engineering programmes, rising from 13.5% in 2019 to 28.5% in 2025. These findings highlight the role of targeted educational initiatives in building a more inclusive pool of future professionals equipped to contribute to disaster risk reduction and climate adaptation.

This work demonstrates that gender-inclusive STEM engagement is a critical capacity-building strategy for advancing resilient, locally grounded, and sustainable coastal futures.

Scaling Inclusive Pedagogy: A Transnational Practice Journey from Zadar to Seville

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This practice paper evaluates the professional growth and pedagogical evolution triggered by the EU-CONEXUS alliance. The journey originated at the University of Zadar in 2024, where participation in inclusive learning environment training provided the catalyst for a new approach to student engagement.

By synthesising these international insights with our own experience at SETU working with marginalised and at-risk learners, we developed a bespoke workshop model designed to re-engage students often excluded from traditional classroom activities. This model underwent a rigorous iterative process: starting as a pilot at the DEC24 conference, expanding into a comprehensive full-day staff development programme in Waterford in May 2025, and culminating in a high-engagement presentation at iCERI25 in Seville.

Central to this progression was the sustained support of EU-CONEXUS, which facilitated both the initial training and subsequent international dissemination. This paper reflects on the "Success Story" of this mobility, demonstrating how alliance-led professional development can bridge the gap between European policy and local classroom practice. We conclude by highlighting how such collaborative journeys create new symbiotic relationships between diverse teaching staff and foster sustainable, equitable learning environments for our learners across the SmUCS network.

Keywords: Inclusive Teaching, Marginalised Learners, Adaptive & Creative Practices, Embodied Knowledge, EU-CONEXUS Mobility, Practice-Led Research, SETU.

Comparison of traditional and modern teaching methods in higher education: perspectives of students and professors

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Contemporary higher education increasingly emphasizes innovative teaching approaches that focus on active learning, critical thinking, collaboration, and the development of competencies necessary for sustainable education. Within this context, Problem-Based Learning (PBL) is gaining importance as an alternative to traditional teacher-centered instruction. This student research project explored differences in perceptions of traditional and modern teaching methods among students and professors in higher education.

The study was conducted at the Department of Teacher Education in Gospić, University of Zadar, using a quantitative research approach. Data were collected through anonymous questionnaires distributed to students and professors. The research examined attitudes toward traditional and modern teaching methods, with particular emphasis on the development of 21st-century competencies associated with sustainable education, such as active learning, collaboration, and practical application of knowledge.

The results show that students generally have more positive attitudes toward modern teaching approaches, especially methods that encourage interaction, participation, and practical application of knowledge. Professors also recognize the value of modern teaching methods, although their evaluations are more balanced and cautious. Both groups highlighted the importance of combining traditional and modern approaches in order to connect theoretical knowledge with practical application and competency development.

The project emphasizes the importance of innovative and student-centered teaching approaches in higher education, as well as the implementation of PBL principles in university teaching in the context of developing 21st-century competencies and supporting sustainable education. In addition, the research demonstrates how student-led research projects can encourage reflection on teaching practice and support the development of sustainable learning environments.

Promoting Sustainable Coastal Tourism with AI? Evidence from Student Campaign Development for a Coastal Destination

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Urban and semi-urban coastal regions face the dual challenge of promoting tourism while supporting sustainable development, responsible recreation and community-sensitive growth. Coastal destinations increasingly rely on digital campaigns to communicate assets such as active travel infrastructure, heritage and outdoor recreation, all of which shape how visitors perceive and engage with place. At the same time, generative AI is rapidly being integrated into marketing practice, raising questions about how such technologies influence the communication of sustainability-oriented tourism initiatives.

This study examines how generative AI affects the development of digital marketing campaigns for a coastal destination operating within a sustainable tourism policy context. The research is situated in a final-year Digital Media Advertising module in which students (N = 40) developed campaign strategies focused on coastal tourism assets, including greenways, coastal towns and outdoor recreation. The module employed a two-phase design: an initial campaign developed without AI, followed by an AI-supported phase, introduced alongside structured guidance on responsible AI use.

A matched pre-post mixed-methods design was used, with surveys capture baseline attitudes, ethical intentions and post-project behaviours, and reflective journals providing qualitative insight into students' decision-making processes. Analysis focuses on how AI-supported workflows shaped the communication of place-based tourism assets, including the specificity, accuracy and contextual grounding of campaign outputs.

Findings indicate that while AI supported idea generation and content structuring, it also introduced challenges for place-sensitive and sustainability-aligned communication. Students frequently reported issues with generic outputs, factual inaccuracies and misalignment with local context, requiring iterative prompting, verification and editorial intervention. Workflow pressures and the effort required to refine AI outputs influenced the consistency with which students maintained critical scrutiny. Across both phases, students described a shift in role from content creator to editor and strategist, assuming responsibility for aligning outputs with destination identity and sustainability messaging.

The findings suggest that AI does not automatically enhance the communication of sustainable coastal tourism, but instead reshapes how such communication is produced, requiring sustained human oversight and contextual judgement. For the EU-CONEXUS alliance, this highlights the importance of developing graduate capabilities that support responsible, context-aware digital communication within coastal tourism systems.

Coastal Resilience and Sustainability (CoReS): a diamond open access journal for a sustainable future

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Coastal Resilience and Sustainability is a multidisciplinary and interdisciplinary international peer-reviewed diamond open-access scholarly journal established within the EU-CONEXUS ENABLES EU project. The journal aims to serve as a central point for collaboration among members of the EU-CONEXUS alliance. This poster presents the step-by-step process of creating the diamond OA journal, explains its aims and scope, details the development of journal policies, and outlines the editorial workflows of the newly established journal. The creation process was not straightforward, and this poster addresses the challenges faced by the task force during its development.

The journal is developed in collaboration with a consortium of European universities, including the University of Zadar (Croatia), Technical University of Civil Engineering Bucharest (Romania), Frederick University (Cyprus), Agricultural University of Athens (Greece), Klaipeda University (Lithuania), La Rochelle Université (France), South East Technological University (Ireland), Catholic University of Valencia (Spain), and the University of Rostock (Germany). The journal primarily addresses researchers and academic staff from these partner universities, but to serve the wider community, it is open for submissions from all interested parties.

To utilise existing structures created within the EU-CONEXUS Alliance, CoReS covers several major subject areas, research themes, and disciplines organised in four established Joint Research Institutes (JRIs): *Coastal Engineering Institute*; *Environmental Sciences and Biodiversity Institute*; *Life Sciences and Biotechnology Institute*; and *Social, Culture and Human Sciences Institute*. Topics include energy efficiency and building performance; renewable energy systems and applications; sustainability and life cycle assessments; smart energy systems; environmental sustainability and climate change in coastal areas; blue growth and development of coastal communities; and social and cultural impact on the environment. The international multidisciplinary editorial board, led by the Editor-in-Chief and Assistant Editor and supported by section editors associated with the JRIs, ensures that all submissions receive proper attention and are reviewed by qualified experts relevant to the field of each article.

CoReS follows all rules established for diamond open-access journals, which will support the journal in the indexing process. It is hosted by one of the co-publishers, the University of Zadar, Croatia, on the OJS Platform Morepress, and all published content is released under the CC BY licence, with necessary identifiers such as DOI and ORCID.

Environmental Anxiety and Coping: How Do Youth in Coastal Regions Cope with Climate Change?

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Climate change is increasingly affecting the emotional lives of young people, particularly those living in coastal areas where environmental change is more visible and personally relevant. This pilot study explores eco-anxiety, ecological grief, and eco-guilt among youth in coastal regions, with a focus on the intensity of these emotional responses and the extent to which they are associated with daily-life impairment.

The study was conducted on a small pilot sample of young people from coastal regions (N = 29) who completed an online survey including validated self-report measures: the Eco-Anxiety Questionnaire (EAQ-22), the Ecological Grief Questionnaire (EGriQ-6), and the Eco-Guilt Questionnaire (EGuiQ-11). Eco-anxiety was analysed through two dimensions: habitual ecological worry and negative consequences in daily life. The present analysis focuses on descriptive statistics, composite means, standard deviations, and item-level comparisons.

Initial findings indicate that participants showed clear climate-related concern, expressed mainly through habitual ecological worry and ecological grief, while severe daily impairment remained low. The pattern suggests concern, empathy, and moral engagement rather than dysfunctional distress. These preliminary results support a non-pathologizing interpretation of climate-related emotions and highlight the importance of future research on coping strategies, resilience, and cross-regional differences among youth in coastal communities.

Sea-breeze fronts as indicators for climate adaptation and health risks in Baltic coastal environments

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Coastal environments are increasingly exposed to the impacts of global climate change, including rising heat stress, changes in local wind regimes, and growing pressure on urban and recreational coastal areas. In this context, better understanding of small-scale coastal atmospheric processes can support more place-based adaptation strategies. This study examines sea-breeze fronts in the Baltic Sea region and discusses their value as practical indicators of maritime climate influence in coastal environments. The work builds on previous research on sea-breeze circulation and repositions it in the context of climate adaptation. The analysis focuses on the warm season of 2018, an exceptionally warm year in the Baltic region, when favorable weather conditions allowed the observation of local breeze dynamics over a large coastal area. Satellite imagery and meteorological observations were used to identify characteristic cloud lines and weather changes associated with sea-breeze development and inland penetration. The aim was not only to detect the phenomenon itself, but also to better understand how marine air moderates local climatic conditions and creates transition zones between coastal and inland territories. The results show that sea-breeze circulation is a recurrent and spatially significant feature along the Baltic coast during the warm season. Its influence may extend tens of kilometers inland, depending on local topography and atmospheric conditions. In the south-eastern Baltic, sea-breeze events were associated with clear daytime shifts in wind direction, air temperature and cloud formation, indicating the regular penetration of cooler marine air into warmer inland areas. These processes can reduce near-surface heat intensity in some coastal zones, affect human thermal comfort, and shape local differences relevant to settlement patterns, tourism, recreation, public health and land-use planning. The study highlights that remote sensing offers a practical and scalable approach for identifying areas influenced by the sea, especially where dense in situ observation networks are lacking. For coastal communities facing climate change, knowledge of sea-breeze behavior may contribute to climate-sensitive planning, heat-risk management, urban design and the broader development of resilient coastal environments. The Baltic Sea region therefore provides a useful case for linking local atmospheric processes with adaptation-oriented coastal research, sustainable urban coastal development, and evidence-informed local adaptation strategies.

Water quality in Mediterranean coastal lagoons: optical remote sensing and in situ validation for assessing the severity of torrential floods

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Mediterranean coastal lagoons are high-value ecological assets currently threatened by an increase in extreme hydro-meteorological events. This study presents a robust framework for monitoring water quality in L'Albufera de València (Spain) by integrating high-resolution Sentinel-2/MSI satellite imagery with rigorous in situ validation campaigns. Our research focuses on assessing the environmental impact and ecosystem resilience following the catastrophic DANA (Extreme Torrential Flood) of October 2024.

Atmospheric correction was performed using the ACOLITE processor, implementing the Dark Spectrum Fitting (DSF) algorithm. The DSF is uniquely suited for characterizing the complex optical environment of hypertrophic waters by effectively mitigating adjacency effects from surrounding land. To ensure maximum accuracy, a custom Python script was developed to automate the reading of Level-2 Water (L2W) NetCDF files. The algorithm extracts spectral data from a 3×3 pixel spatial window centered on sampling coordinates, allowing for a high-precision comparison with laboratory-derived biogeochemical parameters (Chlorophyll-a, SPM, and Turbidity) analyzed under APHA protocols.

Finally, the implementation of this automated workflow enabled the generation of a continuous time series from 2023 to 2026 to quantify the lagoon's recovery state. Model performance was evaluated through an exhaustive statistical analysis, calculating the Coefficient of Determination (R^2), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE). The results demonstrate that the combination of optimal red-edge algorithms and automated extraction tools provides a scalable and essential solution for the sustainable management of coastal ecosystems facing climate-driven socio-ecological transitions.

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Hydrodynamic Model-Based Analysis of Marine Heatwaves in the Southeastern Baltic Sea

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Marine heatwaves are periods of unusually high sea surface temperature lasting at least five consecutive days, and they can affect marine ecosystems by altering biological productivity, promoting algal blooms, increasing species mortality, and causing negative impacts on fisheries and human well-being. In recent years, the frequency and intensity of marine heatwaves have increased globally. The aim of this study is to investigate the spatial and temporal dynamics, as well as long-term trends, of marine heatwaves in the southeastern Baltic Sea over the period of 1994–2023. The analysis is based on high-resolution (approximately 0.3–5 km) hydrodynamic model (SHYFEM) outputs, validated using long-term in situ measurements at two stations, together with satellite-derived sea surface temperature data (NASA MODIS). The model demonstrates high accuracy at both locations. The RMSE between model and in situ temperature data is 1.32 °C at the northern station (1.62 °C at the southern station), while the RMSE between model and satellite data is 0.76 °C at the northern station (1.27 °C at the southern station). Spatial validation further confirms that the model reliably reproduces sea surface temperature across the study area, with high correlation ($R^2 > 0.7$) and RMSE ranging from 0.37 to 3.59 °C, although larger discrepancies are observed in coastal zones. A total of 126 marine heatwave events were identified in the southeastern Baltic Sea during 1994–2023, with durations ranging from 5 to 50 days. Since 2006, the frequency and spatial extent of marine heatwave days have increased, especially after 2015, with large areas experiencing 50–100 days annually, and a peak of over 150 days was recorded in 2020. The strongest increasing trend in marine heatwave days was observed in autumn (~0.74 days per year). In terms of intensity, Category I events dominate; however, they are frequently accompanied by more intense Category II events, and higher-intensity extremes (Categories III and IV) are also observed.

Shore-based monitoring of suction dredgers operating in sensitive coastal zones: artificial vision systems for preventing entry into protected areas

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Dredging activities carried out in coastal zones require a delicate balance between the technical necessities of hydrotechnical works and the obligations to protect vulnerable marine ecosystems. In the proximity of protected areas, controlling the position and trajectory of trailing suction hopper dredgers is something of great importance in order to prevent accidental entry in the perimeters with special conservation status.This paper proposes a shore-based monitoring solution based on two fixed systems similar to the architecture described in the technical reference document. These are developed on Raspberry Pi platforms configured for headless operation, remote connectivity, and real-time visual analysis. The system aims to detect, track, and provide alerts regarding the proximity of the equipment to the boundaries of protected coastal zones by integrating image processing and computer vision algorithms into a low-cost operational surveillance framework.

The proposal follows an internationally validated direction in shore-based vessel monitoring systems, where combinations of coastal sensors, video cameras, and positioning data are used for maritime traffic surveillance and management of activities near marine protected areas. In the dredging sector, monitoring solutions are effective tools for verifying the correct use of contractual work zones, which justifies extending surveillance through automated video solutions capable of providing visual confirmation and additional spatial alerts.

The proposed system involves placing two observation units on the shore, capable of continuously capturing video streams, transmitting data remotely, and running real-time detection and tracking algorithms for naval equipment. Compared to complex systems based on Radar and AIS (Automatic Identification System), this contribution seeks a flexible, reliable and accessible alternative which is suitable for local coastal monitoring applications, especially where targeted surveillance of dredging works near protected habitats is required and mandatory.The paper starts from the premise that such a system does not substitute official navigation, control, or environmental compliance instruments; instead, it functions as an additional layer of observation and warning in order to increase accuracy and redundancy. By aligning with current trends in coastal monitoring and the environmental control of dredging operations, the proposed contribution supports the feasibility of low-cost, modular shore-based surveillance systems as complementary tools for protecting coastal natural heritage.

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A Bioregional Partnership Approach to Address Biodiversity Challenges in Ireland's South East

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Global biodiversity loss has reached an unprecedented crisis, reflected in severe declines observed in Ireland. Ireland's 4th National Biodiversity Action Plan (NBAP) highlights the urgent need for coordinated, effective action. In collaboration with Bioregioning South East Ireland (BioSEI), this research involves a novel, holistic approach to biodiversity rejuvenation. The concept is landscape-scale restoration, adapted for implementation by public bodies and biodiversity-focused organisations across the South East (SE) of Ireland. The project adopts a regional, evidence-based approach, integrating qualitative and quantitative data, to inform a strategic, long-term whole of society, whole of government approach (NBAP Objective 1).

Central to this BioSEI model is the consideration of the SE as a single bioregion: a biogeographically and culturally coherent area defined primarily by watershed boundaries, topography, and shared ecological and social characteristics. The SE bioregion is primarily shaped by the catchments of the Barrow, Nore, Suir and Blackwater rivers, alongside coastal catchments draining from the Comeragh Mountains. It encompasses multiple counties across Leinster and Munster, including the surrounding seascape of Waterford (Figure 1).

Landscape restoration within this bioregion will be guided by a Four Returns (4R) framework, delivering benefits for (i) nature and habitats, (ii) society, (iii) inspiration and cultural connection, and (iv) financial sustainability. Through collaboration with key stakeholders including the Environmental Protection Agency (EPA), National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC) and all Local Authorities across the region, the project is exploring how this framework can inform regional, bioregion-based policy and governance models that move beyond administrative boundaries.

This innovative approach has the potential to position Ireland as a leader in integrated biodiversity restoration, supporting resilient ecosystems and communities for future generations. This research is supported by the Technological University Research and Innovation Supporting Enterprise (TU RISE) fund from the Higher Education Authority (HEA) and the European Regional Development Fund (ERDF).

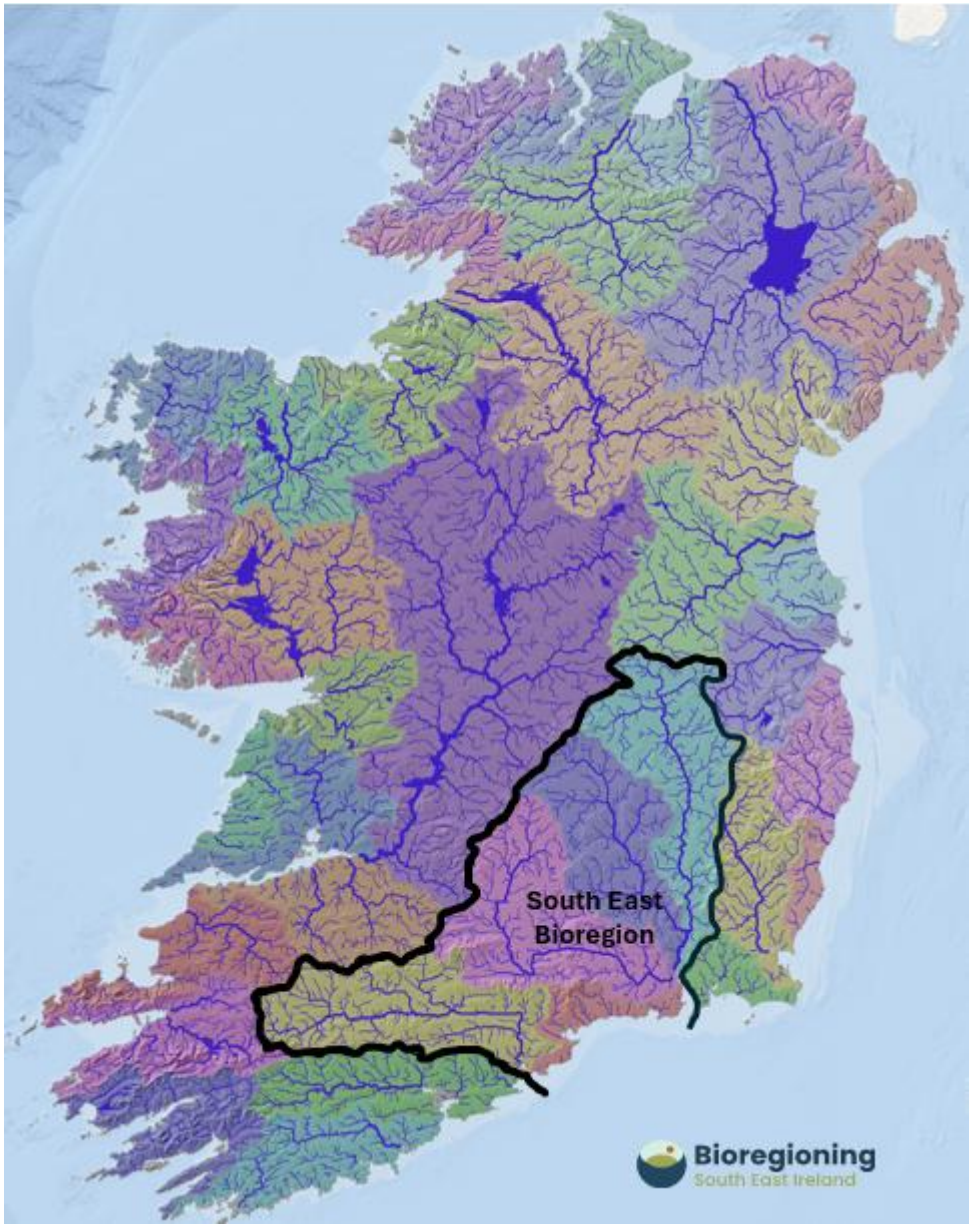

Figure 1: A map of the SE Bioregion in Ireland.

Evaluation of Olive Cultivars for Urban Environments: Morphological Traits, Health Status and Urban Suitability

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Olive trees (Olea europaea L.) are increasingly used in Mediterranean urban landscapes for their ornamental value, drought tolerance, cultural significance, and adaptability to stressful environmental conditions. However, olive cultivars vary considerably in morphology, resilience, and susceptibility to biotic and abiotic stress factors, which may affect their suitability for sustainable urban planting. This study, conducted as part of the EU-CONEXUS Student Research Hub project, aimed to evaluate selected olive cultivars growing in urban environments in Zadar, Croatia. Field assessments included measurements of leaf morphology (leaf length, width, and length/width ratio), visual evaluation of canopy characteristics, and assessment of leaf health parameters such as disease symptoms, pest damage, nutritional stress, and leaf discolouration. A stakeholder survey was also developed to investigate public perception of olive trees in urban landscapes and cultivar preferences. Preliminary results revealed significant variability among cultivars in both morphological and health-related traits. 'Oblica' and 'Leccino' were among the most frequently represented cultivars in urban gardens. Morphological analysis demonstrated clear cultivar-specific differences in leaf dimensions and shape, indicating substantial phenotypic variability among the evaluated olive cultivars. Statistical analysis confirmed a positive relationship between leaf length and width, reflecting consistent growth patterns, while cultivar-specific variations confirmed distinct morphological profiles. 'Levantinka' (92.5%) and 'Coratina' (82.5%) exhibited the highest incidence of disease symptoms, while 'Frantoio' showed no visible disease symptoms. 'Leccino' displayed relatively low disease incidence and good tolerance to biotic stress factors. The highest percentage of non-green leaves was observed in 'Coratina' (62.5%) and 'Oblica' (41.4%), indicating increased physiological or environmental stress. Survey results indicated that most participants perceived olive trees as highly valuable ornamental elements in urban landscapes due to their aesthetic appearance and cultural importance. Respondents also emphasised the importance of cultivar resilience, low maintenance requirements, and reduced fruit drop when selecting olive trees for urban planting. In addition to scientific outcomes, the project actively involved undergraduate students in fieldwork, data collection, survey design, and preliminary statistical analysis, contributing to the acquisition of research, digital, and transferable skills within an international collaborative environment. The project highlights the importance of selecting suitable olive cultivars for sustainable urban landscaping and demonstrates the value of integrating research and education through student-centred scientific activities.

Keywords: leaf morphology, Olea europaea, olive cultivars, stress tolerance, urban landscaping

Comparative Genomic Analysis of Salt and Drought Resilience in Rhizobia Isolated from *Trifolium* and *Medicago* Species

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Climate change is driving a global increase in soil salinity and drought, directly threatening the nitrogen-fixing symbioses that support sustainable agriculture. Since legumes are a staple for global food security, understanding how their microbial partners respond to these stresses is critical for maintaining stable crop yields. As environmental pressures increase, identifying the genomic basis for stress tolerance in rhizobia has become a priority for enhancing crop stability in shifting climates. To investigate these mechanisms, we performed a comparative genomic analysis of eight rhizobial strains isolated from *Trifolium* and *Medicago* species collected from extreme environments of Greece and Cyprus. These eight isolates were strategically selected from a larger collection following in vitro and in planta screening, representing one sensitive and three tolerant strains per host group to allow for a targeted comparison of resilience traits. We employed a hybrid sequencing strategy, combining Oxford Nanopore long reads with Illumina short reads to generate high-quality, contiguous genome assemblies. This approach ensures that complex genomic features, such as large megaplasmids and repetitive regulatory regions, are fully captured. Our analysis focuses on identifying the specific gene clusters, mobile elements, and metabolic pathways that differentiate the robust, tolerant strains from their sensitive counterparts. By resolving these genomic architectures, we aim to uncover the evolutionary strategies used by rhizobia to maintain symbiotic performance under adverse conditions, providing a framework for the development of more resilient bio-inoculants.

Optimisation of non-invasive genetic tools to monitor populations of common pipistrelle (*Pipistrellus pipistrellus)* and soprano pipistrelle (*Pipistrellus pygmeus)* bats in a Living Lab

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Understanding how wildlife populations respond to environmental changes is essential for developing effective nature-based solutions to mitigate these impacts. This project primarily focuses on validating non-invasive genetic tools for monitoring bat populations and is conducted within the Living Lab at South East Technological University (SETU, Ireland). The Living Lab functions as a testbed for designing and optimising non-invasive genetic approaches that are applicable across the wider distribution of target species.This project combines non-invasive field sample collection with molecular and bioinformatic approaches to better characterise bat species diversity and population structure. Fieldwork involves the collection of faecal samples and complementary acoustic monitoring using bat detectors.In the laboratory, extracted DNA is used for species identification, sex typing and dietary analysis using molecular techniques such as quantitative PCR, digital PCR and DNA sequencing. Genetic diversity and population structure are further explored through microsatellite analysis, allowing individual identification and the assessment of relatedness within populations. These data are analysed using bioinformatic tools to construct haplotype networks and assess genetic variability, providing information about population connectivity and dynamics.Additional non-invasive samples collected in parallel from other mammal species (e.g. pine marten, red squirrel) will also be included, as well as the use of portable technologies at the Living Lab including a Bento Lab and MinION sequencer.In summary, by combining traditional field surveys with innovative non-invasive genetic approaches, this pilot study aims to improve our understanding of bat population organisation and how they respond to Smart Urban Coastal Sustainability (SmUCS) challenges, by using integrated field-to-lab molecular biology. This work will help inform effective nature-based solutions to support their ecological needs. Overall, this project has a broad impact by offering a transferable approach that can be applied across different species and ecosystems, and shows how local ecological research can contribute to global environmental challenges.

PS-II biosensing of Ametryn: Sensitive detection using *Lemna minor* thylakoids

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Water is the most abundant and essential component of life. However, growing human activity pose a significant threat to both humans and aquatic life leading to water pollution as more and more contaminants are found in drinking water [1]. Despite regulations set by EU, legislation for pesticide limits in water is scarce while some countries still do not establish maximum residual limits for pesticides found in water [2]. Technologies for detecting and treating water have emerged worldwide but most of them tends to be slow, less precise and time intensive. Therefore, the need for developing faster, highly accurate and sensitive detection methods is vital [1].

Initial toxicity experiments were conducted on *Lemna minor*, the common duckweed which is used in water quality studies to monitor aquatic pollutants. Plants were exposed for seven days to Ametryn, an s-triazine herbicide widely used in agricultural crops worldwide, under semi-static conditions assessing its effects on growth. The IC_{50} value for frond number was found equal to 40.92 ng mL^{-1}. In our study, a novel photosynthetic II – based electrochemical biosensor was also developed and optimized, highlighting its potential use for Ametryn detection in water samples. *Lemna minor*'s thylakoids were extracted and immobilized onto Au/Ag screen printed electrodes via EDC/NHS cross-liking on a TGA substrate. The biosensor effectively detected Ametryn achieving detection limit of 0.12 ng mL^{-1}. Further cross-validation experiments were included using two herbicides (glyphosate and MCPA) that do not target PS-II in order to assess its accuracy and sensitivity, which were both confirmed. The detection limit of our biosensor lies within the maximum residual limits posed by EU (0.1 ng mL^{-1}) highlighting its potential use and application for monitoring agricultural products imported to Europe.

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In-Situ Decarbonization of SMR Hydrogen: A Comparative Exergy-Machine Learning Framework for Blue & Green Hydrogen Ascendancy

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With atmospheric CO_2 concentrations surpassing 420 ppm and carbon credit liabilities tightening toward 2030, grey-hydrogen facilities are becoming the single largest unmanaged point sources inside refineries. Globally, refinery hydrogen networks continue to rely predominantly on grey hydrogen produced via SMR-PSA systems, making them among the largest concentrated industrial sources of unmanaged CO_2. Despite this, existing decarbonization studies remain largely based on idealized, steady-state representations that overlook the cycle-resolved PSA dynamics, purge gas variability, and fuel-integration feedbacks governing real refinery operation, thereby obscuring the true feasibility of blue hydrogen retrofits and limiting informed transition toward green hydrogen. In order to capture realistic syngas evolution, PSA depressurization asymmetry, and CO_2-rich tail gas behavior, this work analyzes in-situ heat and material balance data from an operational SMR-PSA unit. Exergy analysis combined with machine learning evaluates CO_2 capture and hydrogen production efficiency across refinery conditions relying on grey hydrogen. The innovative hybrid approach provides a high-fidelity, refinery specific evaluation of blue and green hydrogen pathways by combining thermodynamic exergy analysis with interpretable machine learning models, such as XGBoost and SHAP. The results show that blue hydrogen with CCS (55–90% capture) offers a practical and affordable short-term option, making use of current infrastructure while drastically lowering emissions. Interpretable models identify key operational drivers, enabling data-driven decarbonization choices and supporting refinery-specific decisions on carbon capture and hydrogen storage, bridging theory and practical transition.

Keywords: Grey hydrogen, Blue hydrogen, Green hydrogen, CO_2 capture, Exergy analysis, Machine learning, Decarbonization, Carbon credits

Twinning ecologies: representing interdependence across more-than-human authors in a coastal landscape digital twin

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This paper examines the challenge of representing the interconnected relationships between authors and actors of a landscape within an Irish coastal landscape digital twin (CLDT). Using the Cuplá Trá project as a case study, it explores how digital twin modelling can be combined with landscape biography methodology to bridge landscape theory and digital representation. This paper is intended to be presented alongside a companion paper, entitled, *"Encoding ecologies: technical challenges of representing more-than-human authors in a coastal digital twin"*, presented by Sinéad Barnett.

Landscape biographies interpret landscapes as layered historical narratives shaped by successive actors and processes and are often used to synthesise environmental and cultural knowledge for spatial design and planning, especially in the Netherlands. The Cuplá Trá project builds on this approach through the creation of a landscape digital twin of an extensive dune system and intertidal lagoon in southeast Ireland. While landscape biographies typically foreground human authors of landscape change, this project shifts attention toward ecological actors that shape and maintain this unique coastal environment. Drawing conceptually on deep ecology (Naess, 2005), the research emphasises interdependence among organisms within this ecosystem. It asks how these *relationships*, typically represented in two-dimensional formats such as a food pyramid, might be visualised within an interactive four-dimensional digital twin model, with the inclusion of temporal changes. Largely devoid of permanent human occupation, the research site is shaped and maintained through ecological interactions between key species and geomorphological forces. The project identifies a select set of flora and fauna that are critical to the formation and persistence of this unique coastal system, partly defined by Nature 2000 codes. Thus, the primary challenges concern both selection (what to include or exclude) and representation: how to meaningfully visualise these authors, their interrelationships, and their interactions with the landscape within the digital twin, while also working across diverse disciplinary perspectives and forms of expertise. By engaging these challenges, the Cúpla Trá proposes new methods for representing ecological authorship in digital landscape models and suggests where digital twins may support more ecologically grounded understandings of coastal landscapes.

Encoding Ecologies: Technical Challenges of Representing More-than-Human Authors in a Coastal Digital Twin

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Building on the framework of *"Twinning ecologies: representing interdependence across more-than-human authors in a coastal landscape digital twin,"* presented by Emily Kim, this paper explores how ecological relationships can be translated into an interactive coastal landscape digital twin (CLDT) developed in the game engine, Unity. While landscape biography understands landscapes as layered narratives shaped by human and ecological actors, turning these relationships into an interactable digital assets requires simplification and careful decision-making.

Using the Cúpla Trá project as an example of an extensive dune system and intertidal lagoon based in Waterford Ireland, this paper focuses on how ecological elements, such as species, habitats, and coastal processes, are selected, organised, and represented within the CLDT. It explores how different types of data, including local knowledge and scientific measurements (e.g., GIS maps, shape layers, json files, reports, etc.) from a variety of government and private agencies, such as, the Environmental Protection Agency (EPA), National Parks and Wildlife Service (NPWS), Biodiversity Ireland, etc, are prioritised and translated into the CLDT.

The CLDT allows users to explore the landscape, toggle between data layers, and experience "what if" scenarios; sea level rise, wind erosion and wild fires. This creates new ways of understanding ecological systems and support learning and experimentation. However, this requires simplifying these complex relationships so they can function smoothly in within the CLDT in real time. Processes like climate change, sea level rise, erosion, and species interactions are turned into interactive features that are both informative and easy to engage with. Real-world complexity and technical limits such as measuring human footfall, animal interactions and the use of data sensors on public land are explored further. Coastal environments are constantly changing, while typical digital twins depend on fixed rules and performance constraints. This creates a new challenge on how to gather and implement this live data into the CLDT. As a result, some ecological knowledge must be reduced, generalised, or left out and shapes how users can interpret the landscape. By making these technical and design choices more visible, the Cúpla Trá CLDT supports a clearer, more transparent and meaningful digital representation of coastal landscapes and actively shapes how coastal environments are understood.

The relationship between dark triad traits, empathy, and altruism across professional contexts

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This paper examines the relationship between the dark triad of personality traits (Machiavellianism, psychopathy, and narcissism), empathy, and altruism across helping and non-helping professions. The study included 293 participants (Mage = 35.66, SDage = 9.47), comprising 217 (74.10%) individuals from helping professions and 76 (25.90%) from non-helping professions. Levels of dark triad traits, empathy, and altruism were assessed, and differences between the two occupational groups were examined. The results indicate that helping and non-helping professions differ only in the level of narcissism – individuals in non-helping professions score significantly higher on this dimension. No differences were found between the groups for Machiavellianism, psychopathy, empathy, or altruism.

Correlation analysis revealed that the dark traits are positively related to each other, while empathy is negatively related to Machiavellianism and narcissism, and strongly positively related to altruism. However, altruism does not show a significant association with the dark traits. A particularly interesting finding is the identification of 14 participants with an atypical profile who simultaneously exhibit high levels of dark traits along with high empathy and altruism – the so-called “dark empaths.” This profile highlights the multidimensional nature of personality, especially in professional contexts.

The findings suggest that professional environments shape and attract certain personality patterns, but also that prosociality and dark traits can coexist. Empathy emerges as a key predictor of altruism, while dark traits, at least in non-clinical populations, have limited ability to predict prosocial behaviour. Future research should consider incorporating measures of cognitive empathy to better understand the distinct roles of emotional and cognitive components of empathy in relation to dark traits and prosocial behaviour, and should also employ more nuanced occupational classifications.

Key words: *dark triad, Machiavellianism, narcissism, psychopathy, empathy, altruism, helping professions, non-helping professions, dark empaths, professional context.*

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