

environ 2026

Dundalk Institute of Technology (DKIT)

27th - 29th April 2026



Habits and Habitats: Adapting Sustainable Practices for Environmental Protection

The 36th Annual Conference of the Environmental Sciences Association of Ireland (ESAI)



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Welcome to ENVIRON 2026 Delegates



Environmental Sciences Association of Ireland (ESAI) Welcome to ENVIRON 2026 Delegates

Dear Delegates,

On behalf of the ESAI Council, we wish to extend a warm welcome to all delegates to our 36th Irish Environmental Researchers Colloquium (Environ 2026). This year the ESAI are collaborating with the Dundalk Institute of Technology to host the event. Environ provides an annual platform for members to showcase their research and to engage with peers, industry partners and the general public. We look forward to meeting all our members in Dundalk to focus on the theme of this year's Environ, "Habits and Habitats: Adapting Sustainable Practices for Environmental Protection". I remember attending Environ while undertaking my PhD studies and have fond memories from that time. The multidisciplinary nature of the conference is one of its main strengths and I hope it will open your world to the vast array of projects currently underway in the environmental sphere across the island of Ireland.

Environ 2026 will commence on the morning of Monday 27th April with a choice of workshops on either 'Climate Resources and Services for Environmental Researchers' or 'Bioinformatics tools workshop – Phylogenetics Practical workshop and Sequence Processing'. This is followed in the afternoon with a choice of a guided tour to DkIT Wind Turbine Tour & History or a workshop on 'AI and NLP for Environmental Research'. On Monday evening, the ESAI and DkIT are delighted to host the National launch of a short film youth biodiversity initiative "Medow Magic" this will be followed by a panel discussion of biodiversity initiatives and education. The evening will commence with a reception at 6.30pm followed by the film premier and panel discussion thereafter.

Environ will formally open on Tuesday, 28th April with an opening address by Dr Diarmuid O'Callaghan (President of DkIT), alongside Dr Tim McCormack (Head of Research), Dr Edel Healy (Head of School of Health and Science), Dr Siobhan Jordan (Head of Department of Agriculture, Food and Animal Health), and Dr Suzanne Linnane (Director of the Centre for Freshwater and Environmental Studies, CFES), Dr Sarah Murnaghan and Dr. Hammond Sarpong DkIT Conference Co-Convenors and ESAI Chairperson, Dr. Niamh Power. The first plenary session will be delivered by Dr Brian MacSharry, Head of the Nature and Biodiversity Group at the European Environment Agency (EEA), who will present the launch of the EEA's five-year State of Europe's Environment Report. This will be followed by Dr Darragh O'Neill (EPA Ireland), who will speak on "Using Research and Evidence to Drive Climate Action." On Wednesday, 29th April, plenary sessions will include Dr Caroline Gilleran Stephens (DkIT) an environmental education expert, followed by Dr Bernard Drumm and Dr Sinéad Loughran from the DkIT Virtual Labs Team.

ENVIRON 2026 Dundalk Institute of Technology

Several interactive events will take place over the two days, including a variety of oral and poster presentations, plenary speakers and social evenings. The ESAI are delighted to announce that this year we have over €3000 in prizes generously donated by our sponsors. These will acknowledge scientific excellence across a range of disciplines including a prize for best overall poster and oral presentation. Environ 2026 will culminate on the afternoon of Wednesday 29th April with the prizegiving ceremony.

The ESAI wishes to sincerely thank Environ 2026 conference co-convenors Dr Sarah Murnaghan and Dr. Hammond Sarpong and all their team at DkIT for hosting Environ and for assembling a very comprehensive programme. We also wish to thank Dr. Sara Meehan for providing excellent administrative support to the event and to take this opportunity to acknowledge her support over the past year. Many thanks Sara.

We look forward to meeting you over the course of the colloquium and look forward to the new science, new technology and new modes of thought which every Environ stimulates.



Dr. Niamh Power, ESAI Chairperson

www.esaiweb.org

Welcome to ENVIRON 2026 Delegates

Dear Delegates,

On behalf of the ENVIRON 2026 Organising Committee, DkIT, we warmly welcome all delegates to the 36th Irish Environmental Researchers' Colloquium, co-hosted by the Environmental Sciences Association of Ireland (ESAI). ENVIRON is the largest gathering of environmental researchers in Ireland, attended annually by 250-300 delegates. ENVIRON 2026 offers an exceptional opportunity to deepen our knowledge and understanding of research around the conference theme: **Habits and Habitats: Adapting Sustainable Practices for Environmental Protection**. This year, we are delighted to have 114 oral presentations and 21 posters scheduled, in addition to 4 cutting-edge environmental workshops. The evening Public Seminar promises to be a highlight with the **national launch of an inspiring short-film youth biodiversity initiative, 'Meadow Magic.'**

The conference theme strongly reflects the current era of acceptance of scientific evidence for unprecedented environmental change and the consequential need for education, public engagement, effective solutions and action. The theme also reflects the multidisciplinary nature of ENVIRON encompassing climate, water, biodiversity, circular economy, waste management, energy, education, emerging pollutants, sustainability, technology and policy and governance. ENVIRON 2026 draws together research from monitoring and observation, experimentation and field evidence, to technical, innovative and ecological-centred solutions to biodiversity decline, habitat destruction, water pollution, air quality decline, climate change impacts, soil degradation, waste and wastewater management and the energy crisis. Within these, ENVIRON 2026 not only centres on environmental issues of local scale but also reaches those of global significance, addressing the 17 [United Nations Sustainable Development Goals](#).

ENVIRON 2026 delegates can avail of 4 innovative and hands-on workshops on Day 1: *Bioinformatics Tools in Phylogenetics and Sequence Processing*; *Climate Resources and Services for Environmental Researchers*; *AI and NLP for Environmental Research: Concepts and Practice* and a tour and history of the first wind turbine to be installed on a college campus worldwide (*DkIT Wind Turbine Tour & History*). At the Public Seminar, on the evening of Day 1, we will host the very exciting **national launch of a short film on a youth biodiversity initiative called 'Meadow Magic.'** The programme for the evening also includes an evening reception and a **panel discussion on Biodiversity Initiatives and Education**, with highly-renowned experts from academia and the arts: *Dr Noeleen Smyth (UCD)*; *Collie Ennis (TCD)*; *Aoibheann McCann (Actor & Writer)* and *Paddy C. Courtney (Actor & Writer)*.

Day 2 will begin with a welcome address and opening speeches from the President of DkIT, Dr Diarmuid O'Callaghan, alongside Dr Tim McCormack (Head of Research), Dr Edel Healy (Head of School of Health and Science), Dr Siobhan Jordan (Head of Department of Agriculture, Food and Animal Health), Dr Suzanne Linnane (Director of the Centre for Freshwater and Environmental Studies, CFES), ENVIRON 2026 Conference Convenors, Dr Sarah Murnaghan (DkIT) and Dr Hammond Antwi Sarpong (DkIT) and ESAI Chairperson, Dr Niamh Power. Plenary speakers include Dr Darragh O'Neill (Senior Manager for Research Strategy, EPA Ireland) and Dr. Brian MacSharry from the **European Environment Agency (EEA)** who will

Welcome to ENVIRON 2026 Delegates

present the **Launch of the EEA's 5-year State of Europe's Environment Report**. Four parallel conference sessions will follow, featuring talks from various keynote chairpersons and environmental researchers, including short 5-minute presentations from early-stage researchers. Opportunities to network and interact with poster presenters will be facilitated in the morning and afternoon. Day 2 will conclude with a drinks reception and the Conference Dinner, followed by music, at the Gateway Hotel (situated on the southern side of DkIT campus).

The last day of the conference, Wednesday 29 April, will open with a **debut conference session on Environmental Education** with plenary talks from DkIT experts in the area: Dr Caroline Gilleran Stephens (Environmental Education Lead, CFES), Dr Sinead Loughran and Dr Bernard Drumm (Virtual Labs research leads). Parallel oral presentation sessions and a dedicated networking and poster session will follow this. The conference will conclude with a student awards ceremony with several student prizes (over €2500 in various categories) including 'Best In Conference', 'DkIT CFES Best Water-related Presentation' and 'DkIT CREDIT Best Renewable and Sustainable Energy Presentation.'

The DkIT Organising Committee are delighted to launch this **excellent conference programme for ENVIRON 2026!** This conference would not be possible without the commitment of our volunteers, organising team, and sponsors, whose support has made this event a reality. We hope all delegates enjoy the conference, their time in Dundalk, and the opportunity to engage with colleagues across the environmental research community. We wish you an insightful three days of learning and networking, and hope that you leave with stronger collaborations and practical insights to support progress on this year's conference theme: **Habits and Habitats: Adapting Sustainable Practices for Environmental Protection.**



Dr Sarah Murnaghan



Dr Hammond Antwi Sarpong

ENVIRON 2026 Conference Convenors,

(on behalf of the ENVIRON 2026 Organising Committee)

ENVIRON 2026 Dundalk Institute of Technology

Environ 2026 Organising Committee DKIT

Co-Chairs & Conference Convenors Sarah Murnaghan & Hammond Antwi Sarpong
Dundalk Institute of Technology

Organizing Committee (Dundalk Institute of Technology unless otherwise indicated)

Sara Meehan, ESAI	Siobhan McCarthy
Clodagh King	Luna McCaffrey
Joseph Lynch	Sergio Moreira
Siobhan Jordan	Pilar Marcos
Lubna Ahmed	Remember Roger Adjei
Abhishek Kaushik	Paul Murphy
Jimena Barrientos Paras	Sinead Loughran
Robert Tambudze	Raymond Byrne
Jade Pollock	Kofi Agyei
Farjana Akter	Mahak Sharma
Hannah Donnelly	Mohadeseh Naderi
Jillian Faughey	Stephanie Woods
Ryan Callan	

Student Volunteer Event Team (Dundalk Institute of Technology) Coordinator: Clodagh King

Daniela Spinenco	Darren Agulonu
Rodrigo Suarez Salomon	Shona McEvoy Elliman
Ali Haider	Hanna Cooper
Muhammad Abu Bakar	Rachael Burns
Patrizia De Camillis	Katie Bolger
Niamh Halpenny	Alžbeta Dziaková
Afroditi Anagnosti	Harlow Ataman
Sara Hermosilla-Vilaseco	Taofiqat Mabogaje
Destiny Johnson	Alexis Oshunloye
Irma Fearon	Rebecca Callan
Olamide Faith Aaron	Malaykah Jamal
Ava Callan	Alana Callan
Hussnain Sabir	Dean Peters
Seyi Folorunsho	Emmanuela Atem

Abstract Reviewers (Dundalk Institute of Technology unless otherwise indicated)

Clodagh King	Siobhan McCarthy
Joseph Lynch	Sergio Moreira
Caroline Gilleran Stephens	Sinead Loughran
Caroline Wynne	Matthew Molloy
Lubna Ahmed	Jack McDonnell
Junli Xu	Suzanne Smith
Hafsah Ahmed	

Thanks to the Environ 2026 Conference Sponsors and Exhibitors

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Department of Agriculture, Food and Animal Health, Dundalk Institute of Technology



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Dundalk Institute of Technology

27th - 29th April 2026

36th Irish Environmental Researchers Colloquium

Habits and Habitats: Adapting Sustainable Practices for Environmental Protection.

INFORMATION FOR DELEGATES

Information for Delegates

Registration

The Colloquium Registration Desk will be on the ground floor in the foyer of the Muirhevna Building, DkIT main campus.

The registration desk will be open at the following times:

Monday 27th April 09:30 – 11:00 / 13:30 – 14:00 / 18:00 – 19:00

Tuesday 28th April 08:30 – 10:00

Wednesday 29th April 09:00 – 10:00

Delegate Badges

Delegates are asked to wear their badges at all times during the colloquium.

Locations

All activities start in the Muirhevna Building, DkIT main campus ([see map here](#)).

Environ Assistants/Event Teams

Environ Assistants will be on duty in all conference rooms and areas and can be identified by **Environ T-shirts**. They will be able to assist you with directions, queries or issues. Members of the Organising Committee will also be available for assistance if required.

Bag Drop

There will be a dedicated coat/bag rack behind the registration desk (no security). Belongings can be left there for the duration of talks/workshops at the owners risk and collected on departure.

Emergency Contact Numbers

Medical Emergencies If a serious medical emergency arises on campus **please call 112 / 999** for emergency services. Alternatively/while awaiting assistance, call the Institute doctor on 042 9320038. For other relevant contact details for emergency situations on campus, please see the following document: [Emergency-First-Aid-Procedures.pdf](#)


Fire Alarms

We are not aware of any Fire drills planned for the dates of the conference, so if you hear an alarm, follow the Fire Exit signs until you reach designated assembly areas outside of the building.

Access to Dundalk Institute of Technology Campus

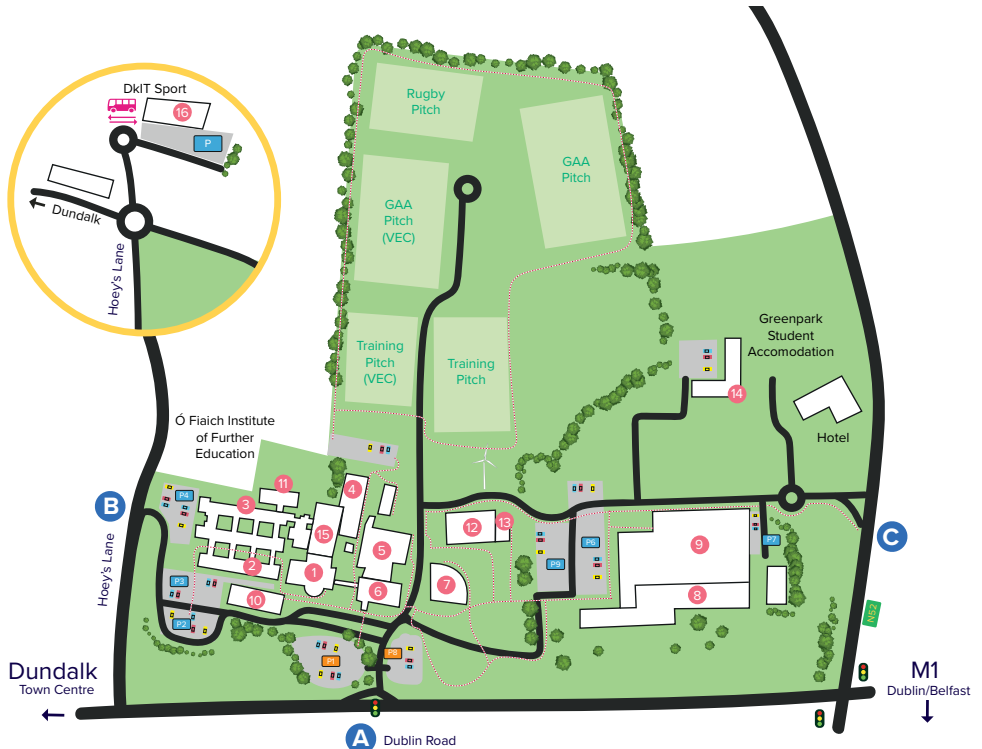
As we are aiming for a Low Carbon conference, we strongly encourage all participants to come to DkIT by public transport, cycling, walking or carpooling. [Use the Plan A Journey | Transport for Ireland](#) application to help plan your journey.

DkIT Campus Map

P1	Car Park at DkIT Sports Complex - Free to all (495 Spaces) - 12 min. walk
	Free Shuttle Bus to and from Campus
P1	Staff Only Car Park (140 Spaces)
P2	Pay & Display Car Park (92 Spaces)
P3	Pay & Display Car Park (130 Spaces)
P4	Pay & Display Car Park (48 Spaces)
P6	Pay & Display Car Park (206 Spaces)
P7	Pay & Display Car Park (28 Spaces)
P8	Staff Only Car Park (68 Spaces)
P9	Car Park - Free to all (104 Spaces)

1. **Dr. TK Whitaker Building**
(Main Reception, Admissions & Library)
 2. **North Building**
(School of Engineering)
 3. **North Building**
(Department of Agriculture, Food & Animal Health)
 4. **South Building**
(School of Business & Humanities)
 5. **Faulkner Building**
(Student Services, Sports Hall & Students Union)
 6. **Faulkner Building**
(Hospitality Training Building)
 7. **Muirhevna Building**
(Department of Nursing, Midwifery & Health Studies)
 8. **P.J. Carroll's Building**
(Apprenticeships & Bright Room)
 9. **P.J. Carroll's Building**
(School of Informatics & Creative Arts)
 10. **Regional Development Centre**
 11. **Jocelyn Bell Burnell Building**
(Department of Life & Health Sciences)
 12. **Campus Restaurant**
 13. **MacAnna Theatre**
 14. **Student Accommodation**
 15. **Student Learning & Development Centre**
 16. **DkIT Sports Complex**
 - A** Main Entrance (Dublin Road)
 - B** Hoey's Lane Entrance
 - C** N52 Entrance
- Footpath Access

Go to www.APCOA.ie for online DkIT car park payment / download the app.



Information for Delegates

Bus Routes and Services

Local buses link Dundalk town centre with DKIT. Stops on Dublin Road sit directly in front of the DkIT campus. Mathews Bus route 900 and Bus Éireann routes 100 and 100X operate between Dublin and Dundalk every hour. These services stop at the DkIT bus stop on Dublin Road, which provides a direct option for delegates travelling from Dublin Airport or Dublin city. Local services, including routes 160, 161, 162, 167, 168 and 169, connect areas such as Blackrock, Bay Estate, Muirhevnamuir and the Long Walk Bus Station. Trips between the town centre and DkIT take under ten minutes. A Student/ Young Adult Leap Card or Visitor Leap Card, and cash payment are accepted on these buses.

Train Services

Dundalk Clarke Station lies on the Dublin-Belfast rail line. Trains operate throughout the day from both directions. The station is a short taxi ride from the DkIT campus and connects delegates arriving from Belfast, Dublin and intermediate towns. This option suits participants seeking fast intercity travel.

Taxi and Private Hire Options in Dundalk

<u>Sevens Taxi Service</u>	+353 87 777 7777
<u>Fives Dundalk Cabs</u>	+353 42 935 5555
<u>Ur Taxi</u>	+353 42 932 2222
<u>JJ Travel Minibus and Coach Hire</u>	+353 86 260 7339

All major taxi and cab apps, such as Free Now, Uber, and Bolt, operate in Dundalk. Delegates can book rides through them. These Taxi and Private Hire Options and Apps support card payments, trip tracking and scheduled bookings. They provide a reliable option for travel between hotels, the train station, the Long Walk Bus Station and the DkIT campus.

Car Parking and Campus Maps

Please note that **parking availability at DkIT main campus is extremely limited**. Student carparks P2, P3, P4, P6 and P9 on the main campus ([see map here](#)) operate a pay and display system via APCOA (cash or QR code) and are available to delegates. Car parks P1 and P8 are reserved for DkIT staff only and are NOT available to delegates. APCOA operate a very **strict clamping regime** for parking in undesignated spaces, undesignated carparks and those that are incorrectly paid.

APCOA rates:

Hourly Rate	€0.30
Daily Rate	€2.00

Please note, the payment of a daily or weekly rate does not guarantee a parking space.

www.apcoa.ie/parking/louth-1/dundalk-institute-of-technology/

Information for Delegates

DkIT Off-campus Parking

A free overflow car park is available at DkIT Sport. The distance from the main campus to the DKIT Sport car park is about 1.8 km by road. A regular free shuttle bus service operates between the main campus and the train station, passing the DkIT Sport stop (map available [here](#)).

Disability Car Parking

The conference activities all take place on the ground floor of the Muirhevna Building. A number of disability car parking spaces are located just in front of the main entrance to the building. Further disability car parking spaces are located in front of the Main Reception. If you have any queries regarding accessibility during the conference, please do not hesitate to contact us: conferences@esaiweb.org

Other Access Information

The [DkIT MazeMap system](#) also provides directions to all buildings, rooms and amenities across campus. A quiet space, the Sensory Garden, is located in the main conference space (Muirhevna building) for quiet time, reflection, meditation and prayer during the conference period and will be available for delegates who require short breaks from busy sessions.

Delegates Giving Oral Presentations

After registering for the colloquium, delegates giving oral presentations are required to **upload presentations** via the Oxford Abstracts platform by **Monday 20 April 2026**. It is vital that all presentations for oral sessions are uploaded by this deadline to allow the organisers time to allocate files to sessions and to ensure the smooth running of conference sessions. **File names for oral presentations** should follow the format: **submitting author's surname, followed by forename**. Presenters are asked to introduce themselves to the session chairs in the assigned session room **at least 10 minutes before the full session begins**.

Delegates Presenting Posters

The poster presentations are located in the M111-M113 area to the left of the foyer in the Muirhevna Building. When you register at the registration desk, please indicate that you have a poster for presentation and we will guide you to the poster area. Posters can be erected on Monday 27 April (10.00-12.00) or on Tuesday morning (08:30-09:15). The first poster session is at 10:50 on Tuesday 28 April. Please do not remove your poster until the end of the poster session at 11:45 on Wednesday 29 April. There will be 3 poster sessions throughout the colloquium. To ensure the colloquium delegates can meet poster presenters we would strongly encourage poster presenters to be by their posters for these sessions to answer any questions. Each presenter is assigned a unique poster ID number (It is the same Abstract submission ID on the Oxford Abstract portal). Your poster must be mounted on the poster board assigned to your ID.

Information for Delegates

Wifi Access

DkIT's Computer Services department provides wireless internet connectivity as a service for staff, students and visitors with wireless-enabled devices. If you are visiting from another college or government office, you may wish to use **eduroam**.

eduroam (education roaming) is the secure, worldwide roaming access service developed for the international research and education community. This service provides extended Wi-Fi access for visiting participants of eduroam to DkIT from other colleges.

If you don't have access to eduroam, you can apply for login details at one of the following locations:

- School Office (if invited by a School)
- Library Helpdesk (if using the Library)
- IT Helpdesk (Contractors, other cases)

DkIT Wireless Usage Information:

You can download and read the Wireless Usage Policy in our Policies section. [Visit Policies](#)

The WiFi services is available in all teaching areas on campus and is provided by eduroam, a secure, world-wide roaming Wi-Fi access service developed for the education community.

Social Media

Please use **#Environ2026**, **@DkIT @CentreforFreshwaterandEnvironmentalSciences** (Linkedin), and **@Environmental Science Association of Ireland ESAI** and **@esai_irl** for your social media posts during and after the event if you post event material.

Conference Dinner

The conference dinner will be hosted in the Gateway Hotel, located just south of DkIT main campus.

- **Address:** Inner Relief Road, Dundalk, A91 EF88, Co.Louth.
- **Phone:** +353 042) 939 4900
- **Location and travel information** can be found on the [hotel website](#).

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Dundalk Institute of Technology

27th - 29th April 2026

36th Irish Environmental Researchers Colloquium

Habits and Habitats: Adapting Sustainable Practices for Environmental Protection.

ENVIRON 2026 CONFERENCE PROGRAMME OUTLINE

Environ 2026

Environ 2026 Conference Programme

Environ 2026 Programme, Monday 27 April 2026	
9:30 – 10:00	Registration Foyer of Muirhevna Building, DkIT main campus
Workshops @ ENVIRON 2026 (Attendees must pre-register) <i>All workshops - meet in foyer of Muirhevna Building, DkIT main campus</i>	
11.00 -13.00	Workshop 1: Climate Resources & Services for Environmental Researchers Facilitators: Dr Joseph Lynch (DkIT); Dr Jack McDonnell (DkIT); Dr Padraig Flattery (MET Eireann/NFCS). <i>Slieve Foy room, De Chastelain Library.</i>
10:00 – 12:00	Workshop 2: Bioinformatics tools workshop – Phylogenetics Practical workshop and Sequence Processing Facilitator: Dr Sergio Moreira (DkIT). <i>M116-M117.</i>
14:00 – 16:00	Workshop 3: DkIT Wind Turbine Tour & History. Facilitator: Dr Raymond Byrne (DkIT).
14.00-17.30	Workshop 4: AI and NLP for Environmental Research: Concepts and Practice. Facilitator: Dr Abhishek Kaushik (DkIT), <i>DkIT Digihub.</i>
18.00-18:30	Reception & Registration
18:30 – 20:00	Public Event: <i>National launch of short film youth biodiversity initiative 'Meadow Magic.'</i> <i>Followed by Panel Discussion on Biodiversity Initiatives and Education.</i> Panel: Dr Noeleen Smyth (UCD); Collie Ennis (TCD); Aoibheann McCann (Actor & Writer); Paddy C. Courtney (Actor & Writer). M128, Muirhevna Building, DkIT main campus

Environ 2026 Programme, Tuesday 28th April 2026				
8:30	Registration Foyer of Muirhevna Building, DkIT main campus			
9:10 – 10:00	Opening Session of ENVIRON 2026 M128, Muirhevna Building, DkIT main campus			
	Conference opening speakers			
	<ul style="list-style-type: none"> ● Dr Diarmuid O'Callaghan, DkIT President. ● Dr Tim McCormack, Head of Research, DkIT. ● Dr Edel Healy, Head of School of Health and Science, DkIT. ● Dr Siobhan Jordan, Head of Department of Agriculture, Food and Animal Health, DkIT. ● Dr Suzanne Linnane, Director of Centre for Freshwater and Environmental Studies (CFES), DkIT. ● ENVIRON 2026 Conference Convenors: Dr Sarah Murnaghan, DkIT & Dr Hammond Antwi Sarpong, DkIT. ● ESAI Chairperson: Dr Niamh Power, MTU. 			
10:00 – 11:00	Keynote Plenary Sessions: M128, Muirhevna Building, DkIT main campus			
	<p>Plenary Session 1: Dr Brian MacSharry - Head of Nature and Biodiversity Group at the European Environment Agency (EEA). "What is the state of the environment in Europe?"</p> <p>Plenary Session 2: Dr Darragh O'Neill -Senior Manager for Research Strategy, EPA Ireland. "Using Research and Evidence to drive Climate Action"</p>			
11:00 – 11:30	Networking, Poster Session, Refreshments & Meet Exhibitors			
11:30 – 13:00	Climate Change Mitigation and Adaptation 1 M128	Circular Bioeconomy, Waste Management and Bioenergy 1 M127	Environmental Monitoring and Remediation 1 M126	Biodiversity Conservation and Ecosystem Restoration M125
13:00 - 14:00	Lunch			

13.15-14.00	ESAI Early Careers Network (ECN) Meeting All Early-Stage Researchers Welcome M128, Muirhevna Building, DkIT main campus			
14:00 – 15:45	Climate Change Mitigation and Adaptation 2 M128	Circular Bioeconomy, Waste Management and Bioenergy 2 M127	Environmental Monitoring and Remediation 2 M126	Microplastics and Emerging Contaminants in the Environment M125
15:45 – 16:15	Networking, Poster Session, Refreshments & Meet Exhibitors			
16:15– 17:30	Climate Change Mitigation and Adaptation 3 M128	Circular Bioeconomy, Waste Management and Bioenergy 3 M127	Emerging Innovations in Agri-Environmental Management M126	AI, Machine learning and Modelling in Environmental Science M125
17:30 – 18.00	ESAI AGM Featuring presentation from the ESAI Postgraduate Researcher of the Year 2026 M128, Muirhevna Building, DkIT main campus			
19:00 – 20:00	Drinks Reception (in The Gateway Hotel)			
20:00	Conference Gala Dinner followed by Music (in The Gateway Hotel)			

Environ 2026 Programme, Wednesday 29th April 2026

9:00 – 10:00	Registration			
9:15 – 9.45	Plenary Session 3: Environmental Education M128, Muirhevna Building, DkIT main campus Dr Caroline Gilleran Stephens (Research Lead for Environmental Education, Centre for Freshwater and Environmental Studies, DkIT) <i>"Bridging Science, Society and Sustainability: Education at the Heart of Environmental Stewardship"</i>			
9.45 - 10.00	Dr Sinead Loughran; Dr Bernard Drumm; DkIT Virtual Labs Team (School of Health and Science, DkIT) <i>"Increasing student confidence in laboratory skills using virtual and digital tools".</i>			
10:00 – 11:35	Environmental Education M128	Policy, Governance and Sustainable Development 1 M127	Marine and Coastal 1 M126	Sustainable Water: Management and Water Conservation 1 M125
11:35 – 12:15	Networking, Poster Session, Refreshments & Meet Exhibitors			
12:15 – 13:15	Policy, Governance and Sustainable Development 2 M128	Sustainable Water: Management and Water Conservation 2 M127	Marine and Coastal 2 M126	Advancements in Renewable and Sustainable Energy Technology M125
13:15 – 14:00	Lunch			
14:00 – 14:45	Student Prize Giving Ceremony "Best in Conference" Close of Conference			

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BIOGRAPHIES

Dundalk Institute of Technology Co-convenor



Dr Sarah Murnaghan

Dr. Sarah Murnaghan is a Lecturer in environmental science in the Department of Agriculture, Food & Animal Health and the Department of Life and Health Sciences, School of Health and Science, Dundalk Institute of Technology (DkIT). Sarah is also a Principal Investigator in the Centre for Freshwater and Environmental Studies (CFES, DkIT). Her multidisciplinary research interests include environmental change, water resource management, lake and catchment management, water quality, climate change and eutrophication, bioremediation, environmental monitoring and assessment, catchment modelling, palaeolimnology/lake sediments, nutrient cycling in aquatic ecosystems, emerging pollutants, circular economy and environmental policy and legislation. She has previously worked on EPA-funded projects, including the EPA FP-7 ILLUMINATE and EPA FP-7 EFFECT research projects, and is currently involved in two TU Create PhD studentships focusing on the areas of bioremediation and agri-environment.



Dr Sarpong Hammond Antwi

Dr Sarpong Hammond Antwi is a research fellow at Dundalk Institute of Technology (DkIT) in Ireland and a recipient of the prestigious Irish Research Council Fellowship. His research focuses on the intersection of water security, energy transition, and climate resilience, emphasising stakeholder engagement, policy analysis, and strategies for effective resource management. With a commitment to community-centred development, Sarpong integrates global insights with local needs to advance sustainable environmental solutions. He is currently analysing key actors and their relationships within the water sector in Ireland and is actively involved in two EU-funded projects: Energy Citizens for Inclusive Decarbonization (ENCLUDE), which promotes inclusive energy transitions, and Resilient River (ResiRiver), aimed at enhancing river system resilience through nature-based solutions. Through his work, Sarpong aims to bridge the gap between research, policy, and practice.

Workshop at Environ: Climate Resources and Services for Environmental Researchers

Monday 27th April 2026



Speaker

Dr Joseph Lynch

Lecturer, Dundalk Institute of Technology

Dr Joseph Lynch is a lecturer in Agricultural Sciences at Dundalk Institute of Technology, and Theme Lead for Agri-Environmental Research in the Centre for Freshwater and Environmental Studies. His research background at DkIT, and previously at Teagasc and Agriculture and Agri-Food Canada, focuses on minimising the risks of losses and improving efficiencies in crop and forage production systems. Current research projects involve evaluating the opportunities for increased species diversity in Irish silage crops and exploring the impacts that projected climate change may have on conventional tillage operations in Ireland.



Speaker

Dr Jack McDonnell

Lecturer, Dundalk Institute of Technology

Dr Jack McDonnell has been a lecturer in Mathematics and Data Science at Dundalk Institute of Technology since 2019. He has a PhD from Maynooth University, in collaboration with Met Éireann and Teagasc, which focused on modelling grass growth to maximise productivity and biodiversity. Before taking up his role in Dundalk IT, he worked in Met Éireann's climate and observations division as a postdoctoral researcher examining how the extremes in Ireland's climate are changing.

Along with Jack's teaching and climate work, his current research interests include modelling air pollution, assessing disease in grasslands, and analysing in-game Gaelic football data. He recently worked on a project with Wexford County Council and Saol Environmental to visualise the levels of air pollution in Wexford. He is also involved in the Legacy Net project, a global network of grassland experiments aiming to improve efficiency and ecosystem services from grasslands.

Workshop at Environ: Climate Resources and Services for Environmental Researchers

Monday 27th April 2026



Speaker

Dr Pádraig Flattery
Senior Climatologist, Met Éireann

Dr Pádraig Flattery is a senior climatologist in Met Éireann's climate services division. He has a MSc. in Climate Change and PhD from Maynooth University (Teagasc Walsh Fellow) which looked at greenhouse gas emissions from Irish soils under future climate change.

As a senior climatologist in Met Éireann, Pádraig engages in analysis of Ireland's past climate, communication of climate change to the public and key sectors of the economy, and the use of climate change projections to assist in adaptation and mitigation of climate change in Ireland. Met Éireann conduct research into climate change in Ireland, and also fund/co-fund climate science activities in Ireland, while participating in international climate change fora including the Copernicus Climate Change Service, and EUMETNET.

Workshop at Environ: Bioinformatics tools workshop – Phylogenetics Practical workshop and Sequence Processing

Monday 27th April 2026

Speaker

Dr Sergio Moreira
Dundalk Institute of Technology

Dr Sergio Moreira is a lecturer in Microbiology and Bioinformatics at Dundalk Institute of Technology, teaching in the field of microbiology and computational methods in the life sciences. He completed his PhD on the population genetics of European bumblebees, exploring how genetic structure and evolutionary processes shape pollinator populations.

Dr Moreira has previous experience in genome assembly and the analysis of endophytic bacteria, supported by a background that combined molecular ecology and bioinformatics. He now focuses primarily on teaching and curriculum development, with a growing interest in the use of data analytics to enhance learning, assessment, and student engagement in third level education.

**Workshop at Environ:
DkIT Wind Turbine Tour & History**

Monday 27th April 2026



Speaker

Dr Raymond Byrne

Lecturer, Dundalk Institute of Technology

Dr Raymond Byrne is a lecturer at Dundalk Institute of Technology (DkIT) in Ireland and has been involved with energy research since 2005. His research interests include distributed wind, wind energy analysis, turbine siting and power performance. He has particular experience in behind-the-meter wind deployment, the use of met masts and LiDARs, and manages an onsite Vestas V52 wind turbine at the DkIT campus. He participates in international wind standards development as member of IEC MT2, associated with revising the IEC 61400-2 small wind standard. He is also the Irish national participant in IEA Wind Task 41 concerning distributed wind systems research. Raymond has carried out a number of wind energy projects with industry and government bodies in Ireland as well as participating in larger European energy research projects. He holds an MSc in renewable energy systems from Loughborough University in the UK, and a PhD from Ulster University that focused on industrial scale behind-the-meter wind deployment in peri-urban wind environments.

**Workshop at Environ: DkIT, AI and NLP for
Environmental Research: Concepts
and Practice & History**

Monday 27th April 2026



Speaker

Dr Abhishek Kaushik,

Programme Director and Lecturer, DkIT

Dr Abhishek Kaushik is the Programme Director of Data Analytics and a active researcher in natural language processing with a focus on applications. He has led multiple AI-driven projects that transform unstructured data into actionable insights. Dr. Kaushik has published extensively in top peer-reviewed journals, contributed to international collaborations, and mentored numerous researchers in AI and data analytics.

**Public Event and Panel Discussion – National Launch
of Short Film 'Meadow Magic' and Discussion on
Biodiversity Initiatives and Education**

Monday 27th April 2026



Chairperson

Paddy Courtney

Actor, Writer, Producer & Veg. Grower, 98 Films.

Paddy C. Courtney is an award-winning actor, IFTA and RT Society, nominated screenwriter and voice artist whose work blends warmth, humour, and storytelling with purpose. After a fifteen-year career in stand-up comedy, he moved into screenwriting and acting, writing on much-loved productions including *Dig in Diner*, *Jessy & Nesity*, *Funny Little Monsters*, and RTÉ's *Blasts From The Past*.

For the past decade, following the success of *Dig in Diner*, Paddy has been a familiar presence at Bord Bia's Bloom Festival, where he works with children to explore empathy through sowing, growing and caring for plants and helping them to be environmentally aware. His hands-on approach connects kindness with biodiversity while encouraging small, positive steps towards climate action.

This message continues in the short film *Meadow Magic*, which he wrote to share a hopeful and fun story about environmental responsibility. He has also collaborated with Green Party councillor Claire Byrne, most notably on the SEAI-supported One Good Idea programme, inspiring students to think creatively about sustainability. Based in Malahide, where he grows his own fruit and vegetables, Paddy champions the idea that small actions can grow into lasting change.

**Public Event and Panel Discussion – National Launch
of Short Film 'Meadow Magic' and Discussion on
Biodiversity Initiatives and Education**

Monday 27th April 2026



Speaker 1

Aoibhéann McCann

Actor, Writer and Director, Athrach

Aoibhéann is an actor, writer and eco-activist. She studied French & Sociology in Maynooth University before training as an actor at the Oxford School of Drama. In 2020, she was awarded Best Actress at the Irish Times Theatre Awards and is a participant of Screen Ireland's X-Pollinator 2024. She runs production company "Athrach" (weareathrach.com)– the focus is to make work as sustainably as possible. In 2023 they made the short film *The Last Harvest* which outdid the Albert calculator. She recently wrote, directed and acted in short film "Step in Time", which is currently in post-production. In 2024 her theatre monologue "Humanitarian", a story of eco-activism with a violent twist, was presented by Landmark's Theatre-For-One at Cork Midsummer Festival and she is now working on the feature script of *Humanitarian*. As an actor, she plays Geraldine in *Blue Lights* S1, 2, 3 & 4. Other recent acting screen credits are "Ellis" (Channel 5), *Coast* (Charmer Pictures) "Clean Sweep" (RTÉ), "Harry Wild" (Acorn), "Yield" (Out of Orbit). Her IMDB can be found [here](#). Recent acting theatre credits have been "Girl on an Altar" (Abbey Theatre), "Twinkletoes" (Abbey Theatre); *Widow Quin*, "The Playboy of the Western World"; *Blanche DuBois*, "A Streetcar Named Desire".



Speaker 2

Dr Noeleen Smyth

**Assistant Professor Horticulture/Environmental Sustainable
Resource Management, UCD**

Dr Noeleen Smyth is a botanist and chartered horticulturalist with national and international experience in environmental issues, amenity horticulture and conservation botany. She is also a university lecturer and communicator with a career that has ranged from managing urban and amenity landscapes and gardens for the OPW and Fingal Co Council to large scale landscape scale forest restoration on Pitcairn Island, South Central Pacific with a specialist interest area in invasive alien plant species. Noeleen works with the National Parks & Wildlife Service on CITES (Convention International Trade in Endangered species of wild fauna and flora) as the National Scientific Authority for Ireland, advising and risk assessing trade in rare species. Her mission is "cultivating a wider perspective" for the role of botany and horticulture and the insights and skills they bring to building a better and more environmentally sound and sustainable future for all.

**Public Event and Panel Discussion – National Launch
of Short Film ‘Meadow Magic’ and Discussion on
Biodiversity Initiatives and Education**

Monday 27th April 2026



Speaker 3

Mr Collie Ennis

Biodiversity Officer, Trinity College Dublin

Collie Ennis is the Biodiversity Officer at Trinity College Dublin and a Naturalist with a passion for Ireland's often overlooked wildlife, particularly amphibians and invertebrates. His work focuses on creating and improving habitats including ponds to support species in both urban and rural settings. A regular voice in Irish media, Collie is known for making wildlife accessible, engaging and relevant to everyday life.

Opening Event

Tuesday 28th April 2026



DkIT President

Dr Diarmuid O'Callaghan

Dr Diarmuid O'Callaghan is the President of Dundalk Institute of Technology, appointed in January 2023. He holds a PhD in animal nutrition and reproductive physiology from University College Dublin and has a strong background in agricultural science and higher education leadership. Prior to his appointment, he served as Registrar at the Institute of Technology Blanchardstown and contributed to the TU4Dublin alliance, supporting the development of Technological University Dublin. As President of DkIT, he leads the institute's strategic direction, oversees executive functions, and drives campus and academic development. His leadership focuses on strengthening regional impact, advancing the institute's ambition for Technological University status, and promoting the health and wellbeing of students and staff.



Dr Tim McCormack
Head of Research, DKIT

Dr Tim McCormack is the Head of Research and Graduate Studies in Dundalk Institute of Technology. Holding a PhD in Chemistry, Dr McCormack is the Director and Founder of the Nanoscale Sensors and Materials Research Group at DKIT.

To date, he has supervised in excess of 15 PhD candidates to completion and blends his research experience, academic knowledge, passion for excellence and leadership skills to support and drive the research agenda within DKIT.



Dr Edel Healy
Head of School of Health and Science, DKIT

Dr Edel Healy is a pharmacologist by background, Edel spent a number of years in UCD as the Irish Kidney Association's Newman Scholar in Nephrology as a Principal Investigator and also lecturing in Pharmacology. Edel worked then for the Health & Safety Authority, where she was a Senior Inspector in the Hazardous Substances Assessment Unit managing a team of chemists, environmental scientists and toxicologists. She represented Ireland on EU working groups / committees in the area of Chemical safety. Edel is currently Head of the School of Health and Science in DKIT and has been in that role since 2007. The School offers a range of undergraduate, postgraduate and part time programmes in Health and Science disciplines. It also has a very active research profile with a number of Research Centres across a range of disciplines. She plays a key role in the academic management and strategic direction of the School and Institute. She also represents DKIT on a number of regional and national committees in a range of areas. She currently represents DKIT on the Louth Children and Young Persons Service Committee.



Dr Siobhan Jordan
Head of Department of Agriculture,
Food and Animal Health, DKIT

Dr Siobhan Jordan is the Head of the Department of Agriculture, Food and Animal Health at Dundalk Institute of Technology (DKIT), where she also lectures and leads research as a principal investigator. She heads a dynamic and multidisciplinary academic department that delivers innovative programmes in veterinary nursing, food, and agriculture, preparing graduates to meet the evolving needs of industry and society.

Dr. Jordan's research interests span a wide range of applied and environmental topics, including organic waste management, constructed wetlands, microplastic contamination, carbon sequestration in soils, and agricultural education. Her work is characterised by strong interdisciplinary collaboration and a commitment to sustainability, environmental protection, and evidence-based practice. Through funded research projects and industry engagement, she contributes to the development of practical solutions to contemporary environmental and agricultural challenges.

A graduate of the University of Limerick, Dr. Jordan holds a B.Sc. (Ed) in Biological Sciences and Education, followed by a PhD from the Department of Biological Sciences. She brings a strong educational foundation to her academic leadership, combining teaching excellence with research innovation and strategic departmental development.



Dr Suzanne Linnane
Director of Centre for Freshwater and
Environmental Studies (CFES), DKIT

Dr Suzanne Linnane is the Director of the Centre for Freshwater and Environmental Studies and Theme Lead for 'Water, Communities and Catchments' at Dundalk Institute of Technology. She is also Senior Lecturer in the School of Health and Science. She is currently serving as the Education Sector representative on the Irish National Water Forum | An Fórum Uisce, a statutory body under the Water Services Act 2017. Much

of her research work is based around source water protection, water policy and governance. Suzanne is passionate about Environmental Education and is co-founder and co-coordinator of the H2O Heroes School's outreach programme.



Dr Niamh Power

Environmental Sciences Association of Ireland Chairperson

Dr Niamh Power is the current Chairperson of the Environmental Science association of Ireland. She is a Lecturer and Researcher, in Munster Technological University, Ireland. She received an honours degree in Civil & Structural Engineering coming top of her class, before pursuing her PhD in the area of waste management, anaerobic digestion and biogas as a transport fuel. Her interests focus on the area of sustainability with particular expertise in waste management, anaerobic digestion, renewable energy from wastes & crops, nutrient recycling, nutrient recover from wastewater, life cycle analysis and policies & drivers for change and the circular economy. She is involved in a number of large national and EU research projects on the circular economy, solar PV (InVEST) and the sustainable use of nutrients, these projects include (ReNu2Cycle, ReNu2Farm and Phos4You), and future resilience of the farming sector (SIMONE).



Session 1: Keynote Speaker

Dr Darragh O'Neill

**Programme Manager for Research & Evidence,
The Environmental Protection Agency. "Using Research
and Evidence to drive Climate Action"**

Dr Darragh O'Neill is Programme Manager at the Environmental Protection Agency (EPA), where he leads the Research and Evidence Programme. In this role, he is responsible for the EPA's Research Programme, its Environmental Analytics Team and its Climate Adaptation and Behavioural Insights Team. Across these areas, the Programme aims to provide high quality evidence to inform national climate and environmental policy. Darragh has a background in the natural sciences, holds a PhD in chemistry and has conducted postdoctoral research in Germany and the UK. Before joining the EPA, he worked at Science Foundation Ireland (now Research Ireland), where he designed research programmes supporting international collaboration, postgraduate training, and climate related research.



Session 2: Keynote Speaker

Dr Brian MacSharry

**Head of Nature and Biodiversity Group
at the European Environment Agency.**

"What is the state of the environment in Europe?"

Dr Brian MacSharry works as an Expert in Biodiversity at the European Environment Agency in Copenhagen. With over two decades of experience, Brian has dedicated his career to conservation efforts, working at various levels from the Irish Government to international platforms. After an initial five-year stint with the Irish government, Brian transitioned to roles focused on gathering and evaluating data related to habitat and species conservation within the EU, as well as the management of protected areas across Europe. Following this, Brian assumed leadership of a team at UNEP-WCMC, overseeing global progress toward Biodiversity Targets, specifically in relation to protected areas. Since 2018, Brian has been at the European Environment Agency, working in a variety of roles leading and supporting work on EU and Global Biodiversity policies. Brian has an extensive experience in protected areas, nature restoration, assessments of the state of nature and mainstreaming nature into the wider society



Climate Change Mitigation and Adaptation

Dr Rory Sheehan

Climate Action Coordinator, Louth County Council

Dr Rory Sheehan is an ecologist and sustainability professional with a broad skill set across the marine, freshwater, uplands and local government. He holds a B.Sc. in marine and freshwater biology, a postgraduate qualification in environmental toxicology and pollution monitoring and a Ph.D in freshwater invasive species ecology. His previous varied research includes water quality assessment, rare fish environmental impact assessment, fish population research, angling promotion, market research, upland ecology and habitat restoration. He is using these skills to drive climate resilience, adaptation and mitigation.



Air and Noise Pollution

Paul McDonald

Managing Director, Sonitus Systems

Paul McDonald is Managing Director of Sonitus Systems, a Cognesense brand, and is keenly interested in how our environment affects people in their everyday lives. He graduated from Trinity College Dublin with a Masters in Mechanical Engineering and spun out his technology research to form Sonitus Systems. He has served on technology committees for the Institute of Acoustics, the WELL Building Institute and as a reviewer for EPA research. His work has allowed him to explore environmental monitoring challenges and related technology solutions all over the world. In his spare time he enjoys planting trees in a quiet corner of County Wexford.



Session 3: Keynote Speaker

Dr Caroline Gilleran Stephens

Centre for Freshwater and Environmental Studies, DKIT.

“Bridging Science, Society and Sustainability: Education at the Heart of Environmental Stewardship”

Dr Caroline Gilleran Stephens is an environmental educator and researcher whose work sits at the intersection of science, society and sustainability. Her work focuses on how education can act as a powerful driver of environmental awareness, behavioural change and long-term stewardship, particularly in relation to water, ecosystems and nature-based learning. With a background in environmental science and education, Caroline is passionate about bridging the gap between research, policy and practice. She has extensive experience working with learners, educators, communities and stakeholders to develop meaningful, place-based approaches to sustainability that connect people to their local environments and empower them to take informed action. Her work explores innovative models of environmental education, the role of experiential and outdoor learning, and the importance of supporting learners in navigating complex environmental challenges. She is particularly interested in how education can foster resilience, agency and hope in the face of climate and ecological change. Caroline contributes to interdisciplinary and collaborative projects at local, national and international levels, and is a strong advocate for inclusive, impactful and practice-informed environmental education. Through her research, teaching and engagement activities, she champions education as a central pillar in shaping sustainable habits, supporting healthy habitats, and building a more resilient future for people and planet.



Session 4: Keynote Speaker

Dr Bernard Drumm

DkIT Virtual Labs Team, School of Health and Science, DkIT.

“Increasing student confidence in laboratory skills using virtual and digital tools”.

Dr Bernard Drumm has been a Lecturer in the Department of Life & Health Sciences since 2020. Dr. Drumm teaches on the BSc (Hons) Biopharmaceutical Science, BSc (Hons) Environmental Bioscience and BSc (Hons) Health & Physical Activity programmes. He is a research active member of faculty in the Smooth Muscle Research Centre, supervising projects on urinary tract physiology and in the Teaching & Learning Research Group. Dr. Drumm is also an Adjunct Associate Professor of Physiology at the University of Nevada, Reno School of Medicine, USA.



Session 4: Keynote Speaker

Dr Sinead Loughran

DkIT Virtual Labs Team, School of Health and Science, DkIT.

“Increasing student confidence in laboratory skills using virtual and digital tools”.

Dr Sinead Loughran is a Senior Lecturer in the Department of Life and Health Sciences at Dundalk Institute of Technology, where she teaches across a range of programmes in bioscience, pharmaceutical science and biopharmaceutical science. She holds a Ph.D. in Molecular Biology and a B.Sc. (Hons) in Biotechnology from Dublin City University and brings over two decades of experience in molecular biology and virology to her academic work. Her research interests include the molecular mechanisms of disease, infectious agents and protein analysis and purification. Beyond laboratory science, she engages in research on technology-enhanced learning, investigating how tools like virtual laboratories and electronic lab notebooks can support practical science education and improve student learning outcomes. This work ties closely to her interest in student engagement and employability in scientific disciplines.



Environmental Education

Jeanette Gill

Development Specialist, Green Tech Skillnet

Jeanette Gill is a senior learning and development specialist in the renewable energy and sustainability sector. She designs and evaluates professional training programmes, develop structured skills pathways, and foster industry–academic collaborations that equip professionals for environmental and sustainability challenges. Their work advances workforce capability and supports Ireland’s green transition through innovative learning and development initiatives.



Policy, Governance, and Sustainable Development

Ciarán Lavin

Senior Behavioural Scientist, Sustainable Energy Authority of Ireland

Ciarán Lavin is a Senior Behavioural Scientist in the Behavioural Economics Unit (BEU) at SEAI. The BEU applies behavioural science to a range of energy-related research areas including social acceptance and adoption of technologies, energy consumption behaviours and their determinants, perceptions of energy system elements and potential policies, energy equity, and active travel. Ciarán’s background is in psychology and cognitive science.



Sustainable Water: Management and Water Conservation

Mark Bowkett

Director, TE Laboratories

Mark Bowkett is a founder and an owner Director of TE Laboratories Ltd (TEL) since its incorporation in 1991. He is also a founder of Aquamonitrix Ltd which was spun out of TEL in 2021.

With 30 years experience in contract testing laboratories combined with a passion for innovation and research a number of technologies have been launched onto the market by combining the chemistry and analytical testing expertise with a well-funded R&D department.

Water quality instrumentation has been a key focus and this applications such as Aquaculture have been identified as a key strategic market for the Aquamonitrix technology where the continual monitoring of Nitrite, Nitrate and ammonia have strategic importance

ESAI Postgraduate Researcher of the Year 2025: Morad Mirzaei, Trinity College Dublin



Morad Mirzaei is a PhD candidate in the School of Natural Sciences, Botany discipline at Trinity College Dublin, focusing on plant ecophysiology, sustainable agriculture, and environmental science. His research explores how plant diversity in grassland ecosystems can enhance agricultural sustainability while contributing to climate change mitigation.

The project, "Assessing the role of multi-species swards in mitigating carbon and greenhouse gas emissions from intensively managed grasslands in Ireland," investigates how increasing plant diversity in pasture systems influences ecosystem function. Specifically, the research evaluates how multi-species grasslands can reduce greenhouse gas emissions, enhance soil carbon sequestration, and improve the resilience and sustainability of grassland-based livestock production systems.

This work is conducted under the supervision of Dr. Matthew Saunders (Discipline of Botany, School of Natural Sciences, Trinity College Dublin), Dr. Rachael Murphy (Teagasc Environment, Soils and Land Use Department and Teagasc Climate Centre), and Dr. Karl Richards (Teagasc Climate Centre). Through this collaboration, the project integrates expertise across plant ecology and ecophysiology, soil science, and agricultural climate research.

The outcomes of this research contribute to national and international efforts to develop climate-resilient agricultural systems that balance food production with environmental sustainability. It also advances interdisciplinary research on grassland ecosystems, biodiversity–ecosystem functioning relationships, and climate mitigation in agricultural landscapes.

This research is supported by Taighde Éireann – Research Ireland under Grant Number 13/RC/2092_P2 through the iCrag Research Ireland Centre for Applied Geosciences.

ESAI Student Competition 2026

The ESAI will be judging all student oral and poster presentations for consideration in this years student competition. All winners will be invited to submit an article on their research project to the ESAI Website and the ESAI E-Zine 'Environews'. Results will be announced at the prize giving ceremony at the close of conference on Wednesday 29th April. Best of luck to everyone!

The prizes and categories this year are:

- ESAI Best Oral Presentation (€500) sponsored by Environmental Sciences Association of Ireland
- ESAI Best Poster Presentation (€250) sponsored by Environmental Sciences Association of Ireland
- Best Wastes & Resources Management Presentation (€250 & 12 month CIWM student membership) sponsored by Chartered Institution of Wastes Management (CIWM)
- Best Water Related Presentation (€250) sponsored by Centre for Freshwater and Environmental Studies DkIT, (CFES)
- Best Biodiversity Presentation (€250) sponsored by Chartered Institute of Ecology and Environmental Management (CIEEM)
- Best Natural History Presentation (€250) sponsored by Irish Naturalists' Journal
- Best Analytical Chemistry Poster (€250) sponsored by Eurachem Ireland
- Richard Fitzgerald Memorial Prize Best Aquatic Environment Poster (€250) sponsored by Eirinn Innovation
- Best Renewable and Sustainable Energy Presentation (€250) sponsored by Centre for Renewables and Energy DkIT
- Best Sustainable Food or Sustainability presentation (€250) sponsored by Clarkes fresh fruit
- Best Social Engagement Presentation (€250) in honour of Michael Ewing sponsored by the Irish Environmental Network

Michael Ewing Remembered



Michael was always an environmentalist but he was much more than that. He lived sustainably and organically before it was a movement, and he made friends and built communities wherever he went. In 2008, he was asked by the Irish Environmental Network to help build their network and in 2010 to build the IEN's advocacy arm, the Environmental Pillar, and the fifth national Social Partner.

Michael was also a member of the National Economic and Social Council and served as a member of the National Climate Dialogue Advisory Committee, the National Advisory Group for the Public Participation Networks and chair of the Green Party Policy Council. His passion for peace and nuclear disarmament led him to work with CND Ireland and meet with communities throughout the country to promote its ideals. After he obtained a masters degree in Environmental Science from Sligo ATU in 2003, he worked on a research project on the Aarhus Convention. From this work, allied with his facilitation skills, he became involved in the Irish Environmental Network.

His core skill was as a facilitator with an ability to unite and bring people along. Regularly working 18 hour days, he assisted the members of the IEN and the Pillar to work together and to trust each other so that the environmental movement had a unified voice on environmental matters. This legacy carries on today and the Environmental Pillar regularly meets with ministers and officials and nominates people to various bodies.

It is impossible to sum up how important Michael was to the environmental community in Ireland and to the IEN and Environmental Pillar. Without him IEN would not be where they are today. He will be a huge loss, but his legacy in helping to build a vibrant environmental network and movement and his contribution to sustainable development, social inclusion and local democracy will live on He was and will remain a keystone of the environmental movement in Ireland. Michael is sadly missed.



ESAI ANNUAL REVIEW 2025

ESAI Chairpersons Address from Dr. Niamh Power



The Environmental Sciences Association of Ireland (ESAI) has been involved in a number of activities throughout 2025 and we will continue this throughout 2026. This end of year report summarises some of the key events and activities throughout 2025.

The highlight of the past year was our Environmental Researchers Colloquium (Environ). The 2025 Environ conference was hosted in collaboration between the ESAI and University College Dublin. This Environ focused on the theme of "One Health for a Sustainable Future". The event took place from the 10th to 12th of March 2025, at its traditional calendar slot of the Easter timeframe.

Environ 2025 commenced on the morning of Monday 10th of March with three interactive workshop on 'Coastal Resilience through Nature-based Solutions', 'HOLOSIE to HOLOSEU: A Digital Solution for Sustainable and Low-Carbon Farming' and, 'Sensor and IoT Solutions for Environmental Applications'. In addition to these workshop there was a visit to UCD Rosemount Environmental Research Station which was very well received. Later that evening saw a lively public engagement panel discussion on 'Your Sustainable Shopping list- how can you engage in more

environmentally conscious shopping', which was open to the public. The panel discussion was expertly chair by Dr. Tom Curran from UCD and speakers from different fields discussed simple ways to make our shopping list more sustainable. A huge thank you to all our panel members on the night Miriam Keegan, Afric O'Sullivan, Pat Kane and Ciara Coleman from Vision Ireland, with great engagement and interest from the general public. The question-and-answer session which followed gave a wonderful insight into the enthusiasm for this topic. The following two days saw a wide variety of presentations showcasing the best of environmental research on the Island of Ireland. I would like to acknowledge Dr Rajat Nag, Dr. Junli Xu, Fiona Quinn and Prof. Paula Bourke and their team for hosting Environ 2025 at UCD. The colloquium in Dublin was a huge success and extremely well organised.

A meeting of the Early Careers Network took place at Environ 2025, which included a session on the grassroots and getting young researchers collaborating. The aim was to highlight the benefit of being within the network, and what members would like to see from it. I hope this network will continue to grow over the next number of years, thanks to the efforts of ESAI council members Nicola Watson and Padraig McDonagh for driving this initiative.

ESAI Chairpersons Address from Dr. Niamh Power

Over the summer period we saw the return of the ESAI undergraduate of the year. In 2025 we saw 12 students nominated by 8 universities. These students excelled in environmental engineering at undergraduate level. It is wonderful to see the width and breath of projects undertaken in the environmental field. The future of environmental research looks bright. This year we also launched the Taught Postgraduate of the Year Award, this award is to recognise students who undertake environmental research as part of a taught programme. In 2025 we saw 3 students nominated by 3 universities and we would like to see this number grow in 2026. We would like to extend our special thanks to all the college liaison officers who worked with us and organised the Level 7, Level 8 and taught Level 9 nominees for their university.

Thanks to Dr Chris McEleney, Dr John Gallagher and Dr Sara Meehan for co-ordinating the "ESAI Postgraduate Researcher of the Year Award". The applications from postgraduates were evaluated according to: [1] Scientific excellence and originality; [2] Impact economic/environmental/ societal) and; [3] Dissemination (conferences, outreach, media). Congratulations to the winner Morad Mirzaei from Trinity College Dublin. Morad Mirzaei's project is entitled "Assessing the role of multi-species swards in mitigating carbon and greenhouse gas emissions from intensively managed grasslands in Ireland". Please come along to see Morad present his research at the ESAI AGM on Tuesday April 28th at 5.00pm.

A key ESAI meeting was held in November 2025 and again in February 2026 to decide on future strategy. We would like to be the association of choice for environmental researchers on the island of Ireland and to improve the knowledge transfer between the research community and society at large. We also aim to provide the best networking opportunities for environmental science research. From this we hope to reach out to those who work in industry, policy, local government and government agencies to help us to promote the excellent research work that is undertaken on the Island of Ireland.



Dr. Niamh Power, ESAI Chairperson

Annual Review 2025

Environ 2025

On behalf of all the team at the ESAI we would like to acknowledge and sincerely thank Environ 2025 conference convenor Dr Rajat Nag, Dr. Junli Xu, Fiona Quinn and Prof. Paula Bourke and all the UCD team for hosting Environ and for assembling a very comprehensive programme, which provided an excellent platform for Environmental Researchers to showcase their work. We also wish to thank Dr Sara Meehan for providing excellent administrative support to the event as always.



One of the highlights of the Environ conference is the panel discussion open to the public, where the science community gets to discuss environmental issues pertinent to the region. In 2025, this event was again, well supported by the scientific community and wider public. The Panel discussion was on 'Your Sustainable Shopping list- how can you engage in more environmentally conscious shopping ' and the panel consisted of Miriam Keegan - founder of sew_sustainable, Pat Kane - founder and CEO of reuzi. ie, Ciara Coleman - Vision Ireland, Dr Aifric O'Sullivan - Associate Professor, UCD School of Agriculture and Food Science and the evening was chaired by Dr Tom Curran - Associate Professor and Vice Principal for Internationalisation in UCD College of Engineering & Architecture. Speakers from different fields discussed their approaches to sustainable shopping, from material choice, to repurposing to supporting charity shops, with great engagement and interest from the general public. Presentations from the panel were followed by a lively questions-and-answer session on the current and future actions that individuals and companies can take, lessons learned from implementing sustainable practices, to the unexpected benefits in addition to the expected benefits. Also included was an optional "Sewing Workshop" with Miriam Keegan, which was a first for the ESAI.



Annual Review 2025

ESAI Prizегiving

The quality of research presented at Environ 2025 was exceptional with 270 delegates, 144 abstracts over the 3 days there with 87 oral presentations, and 57 poster presentations with 26 of these opting to give a 5 minute presentation on their poster. The fact that the vast majority were delivered by young scientists and engineers bodes well for the future of environmental sciences in Ireland. Congratulations to all the winners in the ESAI Environ Student Presentation competition which featured ten awards this year. Special mention to Sarah Nasr, UCD for winning the ESAI Best Oral Presentation for her work on the 'Predicting River Water Temperature using Machine Learning' and to Megan Olley, ATU Galwy for winning the ESAI Best Poster Presentation for her work on 'Exposure to bioplastic leachates impacts growth of freshwater green algae'.



Annual Review 2025

Postgraduate Researcher of the Year Award 2025: 13th Year of Competition / €500 Award

The Postgraduate Researcher of the Year Award 2025, now in its thirteenth year and valued at €500, was awarded to Morad Mirzaei of Trinity College Dublin, under the supervision of Dr. Matthew Saunders. His research, titled "Assessing the role of multi-species swards in mitigating carbon and greenhouse gas emissions from intensively managed grasslands in Ireland," the project tackles the pressing challenge of improving the sustainability of Irish grasslands, given that agriculture accounts for approximately 38% of national greenhouse gas emissions and grasslands are major sources of these emissions. With current emission estimates remaining uncertain, particularly concerning multispecies swards and nitrogen management, Mirzaei's work investigates how diverse grassland systems and improved nitrogen use practices can reduce gaseous emissions and enhance soil carbon sequestration when compared with traditional ryegrass-based systems.



ESAI HEI Undergraduate and Taught

Postgraduate of the Year Award 2024/25

Commencing in 2017 and now in its 8th Year, the ESAI Undergraduate of the Year Award continues to be significant on the Island of Ireland. In 2024 we received 12 nominations from 6 universities and 3rd level institutes across the Island. Well done to all the students who received nominations for excelling at environmental research at undergraduate level. The future looks bright. The ESAI would like to thank the college liaisons for their support in running this initiative each year. The following students were awarded ESAI Undergraduate of the Year: Cormac Harte (Level 8, ATU Donegal), Aoife Hillman-Allen (Level 8, ATU Sligo), Samuel O'Donnell (Level 8, ATU Galway), Grainne Mulcahy (Level 8, MTU Cork), Tara Lawton (Level 7, MTU), Aislinn Hare (Level 8, MTU Kerry), Katie Fallon (Level 8, SETU Waterford), Darren Mc Donald (Level 8, SETU Carlow), Caitlin Chapman (Level 7, SETU Carlow), Clara Hurley (Level 8, Trinity College Dublin), Aine Purcell, (Level 8, University College Cork), Olivia Philo (Level 8, University of Galway)



Annual Review 2025

ESAI Grassroots Award Scheme

The grassroots funding award, sponsored by the Environmental Protection Agency (EPA), has funded a total of ten successful workshops since 2015. In July 2025 a workshop organised by Grace Maher (SETU) on 'The potential of Heritage Wheat as a Crop for Organic Cultivation' took place on Knocknagee Organic Farm & Shankill Castle. The workshop struck a lovely balance between a participatory event, stakeholder outreach and science. The ESAI are delighted to announce that the EPA have announced that they are to support another four workshops under this scheme. Special thanks to the EPA for their continued support. It is anticipated that in 2026 we will see additional workshops coming on-line as a total of 6 workshops were funded in 2025 including two upcoming collaboration workshops between students, researchers and campuses- highlighting the work to the Early Career Network. Details of the scheme can be accessed on our website www.esaiweb.org. You can also access videos from previous winners. There will be a rolling call for future grassroots workshops so if you have an idea for a workshop consider applying.

Communications

ESAI members are the core of the organisation, and the communications team is led by Dr. John Gallagher, TCD who is stepping down from his role in 2026. We welcome your input and participation through our social media channels whether through our Email, LinkedIn, Facebook, Twitter or by subscribing to our Newsletters. At the end of 2025 our communication reach has remained relatively stable in the last 12 months, with marginal overall growth through our suite of different communication avenues. On our social and professional media platforms during 2025, LinkedIn has grown by 6% (700 new connections) and now sits just under 11,000 connections. X followers have reduced by ~4%, but still sits at a strong ~3,260 followers, and similar numbers of Facebook friends (~2,800) have been maintained. The newsletter readers and Listserver mailing list have marginally increased marginally by 3% (now 2040 subscribers) and 9.6% (150 mailees), recognising growth in these means of communication in 2025.

We would like to take this opportunity to thank Dr. John Gallagher for his dedication over the last number in leading the ESAI communication efforts. His dedication has led to an increase in interactions across the board.

A review of communications and the ESAI website is continuing, with costs to revamp and streamline systems and processes proving to be expensive, but additional quotes are being sought in 2026. However, council members will review our communication and website requirements on an on-going basis.

Annual Review 2025

ESAI Council Meeting and AGM

The ESAI had a busy year in 2025, with three Council meetings and an AGM. The AGM was convened to coincide with Environ 2025 and therefore held in UCD. This AGM saw Tom Curran stepped down from council and we would like to acknowledge his contribution over the years. We also saw Philip Shine stepped down as secretary but stayed on as ordinary member, the re-election of a number of council members but also the election of new members. We are delighted to welcome the new ESAI Council members: Dr Hammond Antwi Sarpong (DKIT) who will be Environ 2026 conference co-convenor along with Dr Sarah Murnaghan - we greatly appreciate your efforts and dedication. We look forward to working together and value your contributions to the Council.

Administration support

As we reflect on 2025, we want to express our sincere gratitude to Sara Meehan for performing the role of ESAI Administrator with such dedication and efficiency. Over the past year, Sara has been instrumental in ensuring the smooth running of ESAI, handling queries, coordinating activities, and providing invaluable support to the Council and the wider ESAI community. Her commitment and professionalism have been truly appreciated, and it has been a pleasure working with her. Thank you, Sara, for all your hard work and contributions to ESAI throughout 2025.

On a personal level, I would like to take a moment to sincerely acknowledge the passion, professionalism, and unwavering commitment of the entire ESAI Council. The collective expertise, dedication, and enthusiasm within this group have been truly wonderful. The wealth of knowledge, guidance, and support I have received throughout the year has been invaluable, and I am so grateful for the collaborative spirit and shared vision that drive our work. This is a lovely community to be part of and it has been a privilege to be part of such a committed team. I look forward to continuing our efforts together in the years ahead. Thank you all for your dedication to ESAI and to fostering a stronger environmental community.



Dr. Niamh Power, ESAI Chairperson

Niamh is Lecturer and Principal Investigator within the Sustainable Infrastructure Research & Innovation Group, Munster Technological University.

Making the most of your membership

Benefits of Membership

By becoming a member of ESAI, you will also have access to:

- One of the largest environmental research networks on the Island of Ireland.
- Discounted rates at Environ, the annual Irish Environmental Researchers Colloquium, one of the major activities of the Association. It is now one of the largest national scientific meetings in Ireland attracting up to 300 delegates each year.
- Discounted rates for selected workshops, seminars, further education courses and conferences.
- Access to ESAI listserv
- Eligibility to apply for ESAI Postgraduate Researcher of the Year Award
- Eligibility to apply for ESAI Undergraduate Researcher of the Year Award
- Eligibility to apply for ESAI Grassroots Workshop Funding
- Learn from others and absorb best practice
- Raise the profile of you and your business
- Stimulate new business opportunities
- Innovate and commercialise new products and services
- Members of ESAI will receive free-of-charge E-Newsletters, Environews.
- Sponsorship opportunities

Handy Links For Staying Informed

- Find out more about ESAI Goals and Objectives
<https://www.esaiweb.org/home/about-us/>
- Keeping in touch with the ESAI
<https://www.esaiweb.org/stay-connected/>
- Further information on ESAI Code of Ethics and Constitution
<https://www.esaiweb.org/home/our-policies/>

2025 Events

Date	Event
January 13th	Environ 2025 Call for abstracts closes
February 31st	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call
March 10th - 12th	Environ 2025 – 35th Annual Irish Environmental Researchers Colloquium University College Dublin
March 11th	ESAI AGM 2025 (Held in conjunction with Environ 2025) All members welcome
April 30th	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call
June 3rd	ESAI Undergraduate of Year Awards 2024/25 Review with HEI's commences
June 30th	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call
July 29th	Grassroots The 2025 recipient of the Grassroots Award, Grace Maher SETU hosts The Potential of Heritage Wheat as a Crop for Organic Cultivation
August 31st	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call
September 17th	ESAI HEI nominated Undergraduate of Year 2024/25 Announcements and presentation of certificates (by post!)
October 18th	Undergraduate Membership Offer Free Membership for all Undergraduate Members Scheme Rolled Out
October 31st	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call
November 12th	ESAI Early Careers Network Newsletter Special edition showcasing research from our early career members
November 30th	ESAI Postgraduate Researcher of Year Award Closing date for applications
Decemberr 31st	ESAI Grassroots Workshop Support Scheme Sponsored by EPA – Rolling Call

ESAI INCOME AND EXPENDITURE ACCOUNT 2025

ESAI Income and Expenditure Account		
For the year ended 31 December 2024		
Opening balance as 01/01/25		22,987
Income	€	€
Membership	2,493	
Environ 2025 – Delegate Fee	0	
Environ 2024 – Delegate Fee	29,800	
Environ 2025 - Sponsorship	4,500	
Environ 2024 - Sponsorship	19,150	
Grassroots	3,000	
Prizes	2,250	
Rebate	977	
Other accrued income	490	
Total Income	62,600	
Expenditure	€	€
Environ 2026	2,090	
Environ 2025	21,445	
Prizes	2,750	
Website Maintenance	1,228	
Administration	20,886	
Travel	-	
Accountancy	0	
Bank Charges	2,515	
Insurance	1,050	
Postgrad Prize	500	
Grassroots	644	
Rebates	1,089	
Less accrued website and overpayment	1,355	
Total Expenditure	55,281	
Excess Expenditure over Income		7,379
Closing Balance @ 31/12/25		30,366

End of Year accounts are overseen and approved by external accountant

ESAI Council Members 2025

Chairperson	Dr Niamh Power	chairperson@esaiweb.org
Honorary Secretary	Dr. Chris McEleney	secretary@esaiweb.org
Honorary Treasurer	Dr Thomaé Kakouli-Duarte	treasurer@esaiweb.org
Communications Officer	Dr John Gallagher	communications@esaiweb.org
Editor	Dr Caroline Wynne	c.wynne@epa.ie
Conference Coordinator 2026	Dr Sarah Murnaghan & Dr Hammond Antwi Sarpong	DkIT
Conference Coordinator 2025	Dr Rajat Nag and Dr Junli Xu	University College Dublin
Regular Members	Prof Frances Lucy – ATU Dr Philip Shine – Map of Ag Dr Dorothy Stewart - EPA Mr Liam McCarton - TU Dublin Dr Christopher McEleney - ATU Donegal Dr Graece Tan – SETU Waterford	
Postgraduate Representatives	Nicola Watson - Ulster University Padraig McDonagh - ATU Donegal	earlycareers@esaiweb.org
Membership Officer	c/o Dr Sara Meehan - Administrator	administrator@esaiweb.org

environ 2026



Dundalk Institute of Technology

27th - 29th April 2026

36th Irish Environmental Researchers Colloquium

Habits and Habitats: Adapting Sustainable Practices for Environmental Protection.

ORAL AND POSTER PRESENTATIONS SCHEDULE

All session rooms are located in the Muirhevna Building, DkIT, Main campus, and timings are based on Irish Standard Time (IST).

Tuesday 28 April: 11:30 – 13:00

Climate Change Mitigation and Adaptation 1		Circular Bioeconomy and Waste Management and Bioenergy 1		Environmental Monitoring and Remediation 1		Biodiversity Conservation and Ecosystem Restoration	
Room: M 128		Room: M 127		Room: M 126		Room: M 125	
11:30	Chair: Rory Sheehan (Louth County Council) Keynote: Rory Sheehan “Tackling Climate Action at a Local Government Level”	11:30	Chair: Siobhan Jordan (DkIT)	11:30	Chair: Paul McDonnell (Sonitus Systems) Keynote: Paul McDonnell (Sonitus Systems) “Something in the Air - use of Artificial Intelligence in Air Quality Monitoring”	11:30	Chair: Chris McEleney (ATU)
11:45	Samantha Tobias: Where Habits Meet Habitats: Rethinking Climate Vulnerability in Biocultural Landscapes	11:35	Anthony Oyeogbe: Shaping a Circular Nutrient Future: Co-Created Policy Instruments for Ireland’s Recycled Fertiliser Market	11:45	Marcia Isabel Cadena Aizaga: Tracing legacy pollutants in the Irish marine environment using passive sampling techniques	11:35	Hugh Fitzpatrick: The extent of damaging activities from dumping on commonage habitats across West Connacht
12:00	Ben McCabe: Adapting Sustainable Practices in Regional Theatre						
12:15	Jimmy O’Keeffe: Farming Resilience and Management through Natural Capital (FARM-NC)	11:50	Oksana Avendano Flores: Social Life Cycle Analysis of the Bioeconomy Development: A systematic review	12:00	Shayan Kabiri: High-Resolution Modelling of Agricultural Ammonia Dispersion at Irish Natura 2000 Sites	11:50	Nataliia Kosiuk: Comparative Analysis of Ant Communities within Different Habitats of Western Ireland
12:30	Xu Liu: Understanding Behavioral Drivers of Climate Adaptation in European Living Labs	12:05	Olayinka Franklyn Allison: Evaluation of the R-phycoerythrin pigment from <i>Furcellaria lumbricalis</i> for application in cosmetic formulations	12:15	Flavia Melati Chiappara: Growth assays as novel biomarkers for environmental pollution using water fleas	12:05	Avril Hanbidge: Advancing aquatic biodiversity conservation, monitoring and innovation: Insights from EU-funded projects
12:45	Sara Ayoub: Coastal Vulnerability and Adaptation in the Caribbean under Climate Change: Oral presentation	12:20	Anna Kaskova: Hydrothermal carbonisation as a key step in a cascading biorefinery for valorisation of strongly alkaline residues after biostimulants extraction	12:30	Jingrou Chen: Agitation rate and hydraulic retention time influence the yield of <i>Azolla filiculoides</i> used to remediate an agri-food wastewater	12:20	Niall Walshe: Practitioner perspectives on biodiversity-friendly farming practices across Europe: A bottom-up analysis of uptake and prioritisation
		12:35	Jagdeep Kumar Nayak: Impacts of Mechanical Pre-Treatment Strategies on Green Juice Yield and Protein Precipitation in a Pilot-Scale Grass Biorefinery	12:45	Marguerite Nyhan: Leveraging Largescale Digital Data & AI for Understanding Greenspace & Air Pollution Exposure Inequalities in Urban Areas	12:35	Kofi Dua Agyei: Does NbS Performance Drive Investment? Stakeholder Perceptions and Financing Mechanisms for Freshwater Restoration.
		12:40	Caoimhe Grace: FOLOU: Quantifying Food Waste and Food Loss in the Primary Production sector of Meat and Dairy in Ireland			12:40	Eli Kane: Working towards a high-resolution hyperspectral database of blanket bog vegetation communities

Lunch break: 13:00 -14:00

ESAI Early Careers Network (ECN) Meeting 13.15-14.00 M128, Muirhevna Building, DkIT main campus. **Blue box is a poster with a 5-minute oral presentation*

Tuesday, 28th April: 14:00 – 15:45

Climate Change Mitigation and Adaptation 2		Circular Bioeconomy, Waste Management and Bioenergy 2		Environmental Monitoring and Remediation 2		Microplastics and Emerging Contaminants in the Environment	
Room: M 128		Room: M 127		Room: M 126		Room: M 125	
14:00	Chair: Brian Gilmore (Cement Manufacturers Ireland)	14:00	Chair: Niamh Power (MTU)	14:00	Chair: Frances Lucy (ATU)	14:00	Chair: Clodagh King (DkIT)
14:05	Faisal Mahmood: Climate Change Impacts on Extreme Flood Events: Integrated Hydrological Modelling for the Crookstown River Basin, Co. Cork, Ireland	14:05	Lilian Atira: Effects of recycling derived fertilisers versus conventional fertilisers on soil nematode communities in Irish wheat field trials	14:05	Daniela Lopez: A Soil Chamber Platform for QEPAS Monitoring of Agricultural Greenhouse Gas Emissions Under Controlled Conditions	14:05	Junli Xu: DashMP software: Deep learning automated spectral high-throughput microplastic analysis
14:20	Sakshi Anand: Mapping the Bioeconomy Education Landscape in Ireland: Identifying Gaps and Building Skills for a Circular Bioeconomy Transition	14:20	Dónal Kinsella: Optimising sulphur nutrition of a grass-white clover sward increases apparent biological nitrogen fixation and reduces nitrate leaching in the local bioeconomy	14:20	Alejandra Vieyra-Ramirez: Ecological linkages between nematode and plant diversity in an Irish built environment: lessons on soil health	14:20	Jimena Barrientos-Paras: Application of lignocellulosic and anaerobic digestate-derived biochars for Microplastic adsorption
14:35	Beulah Lazarus: Mapping Energy Poverty: From European Policy to Local Action in Ireland	14:35	Shwe Yie Lin: Textile Waste Management in Ireland: A PESTEL-SWOT Analysis for Sustainable Transition	14:35	Deirdre Lynch: Hidden Exposure: An Inventory of Mercury Identifying Gaps in Irish Pollutant Tracking: Oral presentation	14:35	Swarna Halder: Microplastic Pollution in Marine Environments: A Global Review of Occurrence, Field Observation and Transport Modelling
14:50	Ana Julieth Calderon Marquez: Operational emissions and fuel transitions in farmed seaweed: implications for blue carbon assessments	14:50	An Hoang Luu: Pre-treatment strategy to valorise cotton-rich textile waste into fermentable sugars for bioconversion	14:50	Muhammad Inam Bari: Water Table Position Mapping in an Irish Blanket Bog Site Using Vegetation Metrics and Hydrological Monitoring	14:50	Hayley Corbett: Upgrading slow sand filtration: exploring the practicality of traditional technology for the 21st century
15:05	Ana Julieth Calderon Marquez: Wild seaweed systems in Europe: an evidence-based assessment of their relevance for blue carbon accounting	15:05	Hongkun Zhu: Impulse Responses of Biogenic CO ₂ Potential Supply and Fossil CO ₂ Consumption: A Panel VAR Approach considering nine EU Countries	15:05	Alexander Savelev: Detection of Chemicals of Concern in surface waters sampled via Citizen Science	15:05	Anne Leung: The Impact of Smoked and Non-smoked Cigarette Filters on Aquatic Ecosystems using Daphnia as Bioindicators
15:20	Rohankumar Solanki: Environmental Life Cycle Assessment of Irish Wool	15:20	Clodagh Carr: Establishing multi-actor transition groups to drive improved nutrient management at the regional scale in Europe	15:20	Akser Alam Siddiqua Maya: Preparation of Calibration Protocol to Characterize and Quantify Organic Matter in Synthetic Dairy Wastewater using Fluorescence Excitation–Emission Matrix.	15:20	Helen Burke: Urban Drains to Coastal Waters: Sub-Kilometre Analysis of PFAS from Stormwater Outfalls
		15:35	Soumya Padinjarakavil: Biodegradable foam synthesized from lignin rich brewers spent grain waste with potential use as a sustainable alternative for packaging applications	15:25	Georgina Mooney: Monitoring and assessing the effectiveness of small-scale wetland ponds as an ecological water quality restoration measure in agricultural catchments	15:35	Liana Zoumpouli: Impact of microplastic fibres on membrane-based wastewater treatment

Coffee break: 15:45-16:15

Networking, Poster Session & Meet the Exhibitors. **Blue box is a poster with a 5-minute oral presentation*

Tuesday, 28th April 16:15 – 17:30

Climate Change Mitigation and Adaptation 3		Circular Bioeconomy, Waste Management and Bioenergy 3		Emerging Innovations in Agri-Environmental Management		AI, Machine learning and Modelling in Environmental Science	
Room: M 128		Room: M 127		Room: 126		Room: M 125	
16:15	Chair: Pilar Marcos (DkIT)	16:15	Chair: Padraig McDonagh (ATU)	16:15	Chair: Joe Lynch (DkIT)	16:15	Chair: Abhishek Kaushik Keynote: Abhishek Kaushik (Department of Computing Science and Mathematics, DkIT). “Student Perspectives on Artificial Intelligence in Environmental Studies across Various Disciplines Bridging Sustainable Monitoring”
16:20	Ella Mulkerrins: Perennial ryegrass varietal selection for improved resilience to fungal disease as a climate adaptation strategy	16:20	Avinash Chauhan: Development of a Structured Techno-Economic Assessment Framework for Humic Substance Recovery from Anaerobic Digestate	16:20	Robert K. Tambudze: Effects of Cereal–Legume Intercropping on Protein and Land-Use Efficiency in a Whole-cropping System	16:35	Frederick Akpomie: Analytical Insights into Cyanobacterial Bloom: Lough Neagh Analysis for Water Management Case Study
16:35	Farjana Akter: Historical yield improvement trends for major tillage crops across Ireland relative to seasonal temperature and precipitation indices	16:35	William Horan: Sensitivity Analysis of Construction Timber Climate Change Impact Displacement Factors for Irish Residential Scheme Buildings	16:35	Remember Roger Adjei: From Risk to Resource: Evaluating Rainfall Impact and Harvesting Potential for Irish Harvest Operations	16:50	Avinash Nagarajan: AI-Powered Energy Profile Tool for Rural Energy Communities
16:50	Farjana Akter: Impacts of sowing date selection on Irish cereal yield simulations under future climate change	16:50	Shon George Shiju: Enhancing Humic Substance Recovery from Wastewater Digestates through Hydrothermal Processing	16:50	Ismaeel Abdulsalam: Interactive Effects of Arbuscular Mycorrhizal Fungi and Different Levels of Anaerobic Digestate on Phosphorus Uptake Efficiency of Perennial Ryegrass	17:05	Tuan Booso: Rescuing Lost Records: Virtual Gauging of a Decommissioned River Station Using a Hierarchical Machine-Learning Framework
17:05	Jonathan Leather: Advancing Regional Climate Resilience in County Louth: Findings from Phase 1 and Early Insights from Phase 2 of the CLIMAAX Programme	17:05	Daragh Cogley: Circular Bioeconomy as Reharmonisation: Interpreting the Double Spiral as Right Relationship Between Economic Activity and Natural Cycles.	17:05	Rakesh Rayapureddi: Why Sustainable Feed Innovations Struggle to Translate into Adoption: A Macro-Environmental Evidence Map of Duckweed-Derived Protein in Europe	17:20	Musfir Ameen: Integrated Molecular and Optical Assessment of Aged Paints: ATR-FTIR Characterisation and Transferable Colour Prediction Models for Reuse Applications.
17:20	Soliu O. Mustapha: Herbage dry matter yield and species composition of novel grassland swards in their establishment year	17:10	Michelle McMullan: Developing circular economy systems and new KPIs to promote green hydrogen production and other co-product and by-product utilisation in the water and wastewater sector	17:20	Beauty Ezinne Japhet: Life Cycle Sustainability of Gluten-Free Food Systems: A Systematic Review of Evidence Gaps and Nutritional Functional Unit Integration		

ESAI AGM featuring Postgraduate Researcher of the Year 2026; 17:15 - 17:45, M128, Muirhevna Building, DkIT main campus. The Gateway Hotel for the Conference Dinner, 19:00 – 20:00. *Blue box is a poster with a 5-minute oral presentation.

Wednesday, 29th April: 10:00 – 11:35

	Environmental Education	Policy, Governance and Sustainable Development 1	Marine and Coastal 1	Sustainable water: management and water conservation 1
	Room: M 128	Room: M 127	Room: M 126	Room: M 125
10:00	Chair: Caroline Gilleran Stephens (DkIT) Keynote: Jeanette Gill (Skillnet Offshore Wind Academy and GTS) “Green Tech SkillnetCo creation and partnerships in lifelong learning”	10:00 Chair: Ciaran Lavin Keynote: Ciaran Lavin (SEAI) “Public support for energy sufficiency policies in Ireland”	10:00 Chair: Lubna Ahmed (DkIT)	10:00 Chair: Mark Bowkett (T.E. Laboratories) Keynote: Mark Bowkett “Moving Environmental analysis into the field. Challenges and opportunities”
10:15	Daisy Odunze: Mapping Bioeconomy Integration and Measuring Transition Readiness: A structural review of Environmental Sciences / Management degree programmes curricular in the context of Ireland’s National Bioeconomy Strategy	10:15 Aiza Ahmad: Aligning Building Geometry with Environmental Conditions: A Spatial Assessment of Rooftop PV Performance in Ireland	10:05 Saule Akhmetkaliyeva: Where does organic matter come from in Irish saltmarshes?	10:15 David Greaney: Shiga toxin-producing E. coli (STEC) serogroups in private groundwater wells: frequent and persistent detection in increasingly vulnerable hydrogeological settings
10:30	Aminah Dastan: Toward Regenerative Festivals; salutogenic celebration for holistic well-being	10:30 Daniel Burke: Planning for sustainable, low-carbon, and healthy food access in Ireland: empirical evidence from a national survey	10:20 Emily Schwalbe: Community Engaged Research for Coastal Challenges	10:30 Valerie McCarthy: Potential Source Water Protection Measures to Mitigate Against Organic Matter Using Ireland as A Case Study
10:45	Cathal Flood: Tales from the watering hole: How citizen science influenced an Irish farmers practice and aims to inspire behavioural change with landowners for water quality and river habitat improvement via the Cross border CALM (Catchment Action for Local Management) initiative on the Glyde.	10:45 Ailish. M. O’ Brien: Making a Splash: Environmental Sustainability Policy Integration in Irish Water-Based Sporting Bodies	10:35 Ragna Hoogenboom: The Effect of Elevated CO2 and Temperature on the Carbon Sequestration Potential of Saltmarsh Grasses Puccinellia maritima and Spartina anglica	10:45 Liton Chandra Mazumder: Catchment-to-Reach Scale Modelling of Sediment Dynamics using Integrated SWAT and HEC-RAS: Application to the River Mulkear Catchment, Ireland
10:50	Stephanie Woods: Environmental Education for Empowerment – A Response to Eco-anxiety Among Young People in Ireland	11:00 Jamie Murray: BioCultúr - Proposing the need for a biocultural bioeconomy	10:50 Eliza Fairchild: Investigating Spatial Distribution of Soil Carbon in an Irish Saltmarsh Ecosystem	11:00 Prosper Kebaya: Erosion-driven soil carbon dynamics in a headwater agricultural catchment dominated by microtopography
			11:05 Tuan Booso: Toward a Hydrological Digital Twin: Basin-Scale Availability-Adaptive Reconstruction of Streamflow	11:15 Nathan Maréchal: Catchment Communities: Development of an Interdisciplinary Framework for Citizen Science-Based Monitoring of Water Quality in Ireland

Coffee break: 11:35 - 12:15. Networking, Poster Session & Meet the Exhibitors. *Blue box is a poster with a 5-minute oral presentation

Wednesday, 29th April. 12:15 – 13:15

	Policy, Governance, and Sustainable Development 2	Sustainable water: management and water conservation 2	Marine and Coastal 2	Advancements in renewable and sustainable energy technology
	Room: M 128	Room: M 127	Room: M 126	Room: M 125
12:15	Chair: Pilar Marcos (DkIT)	Chair: Suzanne Linnane (DkIT)	Chair: Graece Tan (SETU)	Chair: Fergal O'Rourke (DkIT)
12:20	Marie Taylor: Cultivating Sustainable Habits: Education and Innovation for Sustainable Market Gardening	12:20 Patti Roche: Contrasting phosphorus build-up and drawdown dynamics in grasslands with differing soil structure	12:20 Naga Venkata Sudha Rani Nalakkurthi: Data-Driven Coastal Resilience: Integrating FAIR Data, Environmental Monitoring, and Digital Tools to Support Nature-Based Climate Adaptation	12:20 Mohammad Sameti: Biomass estimation multi-sectoral computational framework for Ireland
12:35	Zack Twamley: Meeting in the middle? The interplay of targets and institutional support in Ireland's phase out of hydrofluorocarbons	12:35 Mahak Sharma: Analysing the role of stakeholder engagement within the Irish water governance system	12:35 Patrick Sode: Anthropogenic activity in a coastal urban area: Occurrence of pesticides, pharmaceuticals, and UV filters in Dublin Bay	12:35 Mohadeseh Naderi: Modelling of an Alkaline Water Electrolyser in Aspen Plus 12:50 Daniel Dransfield: Analysis of Solar PV Usage and Subsequent Optimisation to Maximise the Benefits for Residential Properties in Ireland
12:50	Michelle Burke: Creative Climate Action as a Catalyst for Transformative Community Change	12:50 Armando Corona Ramirez: The role of individuals in driving sustainable water consumption behaviour within regulatory institutions in Ireland	12:50 Nicolette Sale: Analysis of Seawater and Oysters from Dublin Marine Coasts for Contaminants of Emerging Concern	13:05 Zak Hawthorne: Comprehensive modelling methodology for a Wells turbine through computational fluid dynamics
13:05	Jeovan A. Araújo: Advancing Sustainable Transition in Maritime SMEs: The Impact4Mar Transnational Approach in the Atlantic Area		13:05 Sergio Sanchez-Carrillo: From Effluent to Beach: Metagenomic Mapping of Clinically Relevant Antibiotic Resistance Gene Hotspots in a Coastal System	13:20 Mahamad Yousif: Co-Digestion of Grass Silage and Cattle Slurry for Grid Decarbonisation and Phosphorus Sequestration
13:20	Aon Waqas Awan: Just Transition Indicators in Agri-Food Systems: A Systematic Literature Review		13:20 Juan Esteban Quintero-Marin: Smart Pebbles in Coastal Citizen Science: Lessons from Environmental Co-Monitoring with Local Communities at Killiney Beach, Ireland	13:35 Conor Cassidy: Evaluation of ternary iron nickel boride electrocatalysts in sustainable electrochemical energy production

Lunch break: 13:15 – 14:00

14:00 -14:45: Student Prize Giving Ceremony "Best in Conference", Close of Conference **Blue box is Poster with 5-minute oral presentation*

environ 2026



Dundalk Institute of Technology

27th - 29th April 2026

36th Irish Environmental Researchers Colloquium

Habits and Habitats: Adapting Sustainable Practices for Environmental Protection.

ORAL AND POSTER PRESENTATIONS

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Session Theme: Climate Change Mitigation and Adaptation.

Where Habits Meet Habitats: Rethinking Climate Vulnerability in Biocultural Landscapes

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Abstract:

Climate change is increasingly recognised as a threat to cultural landscapes. Yet most Climate Vulnerability Assessments (CVAs) overlook the everyday practices and intergenerational knowledge through which communities shape these landscapes. This paper addresses this gap by reflecting on the methodological challenges of assessing the climate vulnerability of biocultural heritage – the interlinked ‘habits and habitats’ that sustain living cultural landscapes. This research develops and tests a CVA framework tailored specifically to biocultural heritage. The framework combines environmental data, landscape observation, and semi-structured interviews to examine how climate pressures affect landscapes and the practices that shape them. Empirical insights are drawn from Connemara, a rural coastal region in western Ireland, where biocultural practices such as hill farming, traditional haymaking, and dry-stone walling play a key role in sustaining biodiversity and cultural identity. Preliminary results indicate that increased rainfall, soil saturation, species change, and erosion are reshaping land-use practices and seasonal rhythms. The changes demonstrate that biocultural heritage cannot be separated from landscapes: climate impacts alter community relationships with the land and the continuity of local knowledge systems. This paper explores how the iterative design process of the CVA and field-based insights from Connemara informed one another, leading to methodological refinements. In particular, observational research and interview structure were refined to capture differences in vulnerability depending on landscape components, biocultural practices, and their interactions. Drawing on examples from Connemara, the paper discusses the challenges of operationalising these interdependencies within vulnerability assessments. Thus the paper contributes, first, by arguing that biocultural heritage must be recognised, recorded, and incorporated into vulnerability assessments and climate adaptation strategies, and second, by offering methodological insights towards more inclusive approaches to vulnerability that foreground community knowledge alongside environmental data.

Presentation Type: Oral

Adapting Sustainable Practices in Regional Theatre

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Abstract:

An immediate end to 'business as usual' is required to cut greenhouse gas emissions to levels required for us to meet our legally binding obligations under the Paris Agreement by 2030. Most discussions on sustainable adaptation focus on industries like construction, manufacturing, agriculture, finance, and transport. However, arts and theatres also need to adapt for environmental protection and climate change mitigation. The theatre sector has developed the Theatre Green Book as a generic guide to reduce the environmental impact of performance, operations and theatre buildings. However, there is a gap in the literature as to how regional theatres in Ireland are adapting to climate change. This paper will explore how two regional theatres and arts centres, Íontas Arts and Community Resource Centre in Castleblayney, County Monaghan and An Táin Arts Centre in Dundalk, County Louth, are beginning to address their sustainability obligations. In particular, this paper will qualitatively analyse some of the established food and beverage habits of both study theatres through a sustainability lens. Research findings will be compared with the food ethos of resident artists and theatre employees to identify any disconnect between the theatre's established food system and the food values of those working in the study theatres and arts centres. The results of this research can aid other smaller regional theatres and arts centres as they adapt to more sustainable food practices.

Presentation Type: Oral

Farming Resilience and Management through Natural Capital (FARM-NC)

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Abstract:

The environmental impacts of modern agricultural systems are well documented, with intensification contributing to declining water quality, increased greenhouse gas emissions and significant biodiversity loss. As agriculture occupies 68% of Ireland's land area, addressing national climate and biodiversity challenges is impossible without farmer engagement. Small farms are particularly important, representing 36% of farms and 15% of agricultural land, yet often operate with limited financial capacity. Recent national evidence highlights continued deterioration in soils, water, climate and biodiversity, underscoring the need for an agricultural transition that improves environmental outcomes. Farmers are recognised as essential to achieving State commitments across climate, biodiversity and water policy, and 41% of small farm operators have expressed interest in agri-environmental schemes. Using a multidisciplinary approach, including natural capital (NC) accounting, participatory stakeholder modelling, systems thinking, environmental monitoring and policy integration, the FARM-NC project aims to create a comprehensive and adaptable framework for evaluating and enhancing NC and critical ecosystem services at a farm level in Ireland. The project seeks to balance achieving environmental resilience with just transition, ensuring farmers are supported to farm while promoting and enhancing key ecosystem services including flood risk reduction, biodiversity, and climate change mitigation. This will involve mapping, measuring, monitoring, and evaluating natural capital and ecosystem services on a farm level, and integrating this data with farmer decision making and farm management information. This will be used to generate robust, whole-farm, NC accounts, demonstrating the financial and sustainability benefits of undertaking NC accounting at a farm level. While focusing on small to medium sized farms, the FARM-NC framework is designed to be accessible, transferable and adaptable, ensuring that its outcomes can be applied across various farm types and regions.

Presentation Type: Oral

Coastal Vulnerability and Adaptation in the Caribbean under Climate Change

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Abstract:

Climate change is intensifying coastal risks across the Caribbean, especially along low-lying shorelines that are highly exposed to sea-level rise, storm surges, and coastal erosion. This study examines the range of coastal risks associated with climate changes affecting the region and reviews the strategies proposed for adaptation. The review highlights that adaptation efforts in the Caribbean are often shaped by institutional, regulatory, and governance challenges, which can limit coordination and long-term effectiveness. While various approaches have been applied across the region, their implementation mostly occurs in isolation rather than through integrated frameworks. Expanding stakeholder engagement is also identified as an important factor in advancing resilience. Overall, the study emphasises that integrated approaches are essential to support sustainable coastal resilience in the Caribbean under changing climate conditions. The findings of this research provide guidance for strengthening sustainable coastal resilience in the region.

Presentation Type: Oral

Understanding Behavioral Drivers of Climate Adaptation in European Living Labs

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Abstract:

Climate change continues to pose profound risks to human well-being and socio-ecological systems, demanding transformative adaptation pathways that engage diverse societal actors. While scientific consensus underscores the urgency of accelerating climate adaptation, the mechanisms through which communities and stakeholders can be effectively empowered to adopt adaptive behaviours remain insufficiently understood. Addressing this gap, this study explores how living lab approach can function as enabling environments that accelerate behavioural transformation in climate adaptation processes. Living labs have gained recognition as collaborative experimentation spaces supporting sustainability transitions through co-creation and multi-stakeholder engagement within the quadruple helix model. Despite their growing application in innovation and transition studies, limited research has examined how integrative living lab processes foster behavioural change among actors involved in climate adaptation. This study therefore aims to identify key accelerating factors that influence local communities' adaptive climate behaviour within living lab settings. A mixed-methods design was adopted, combining baseline surveys and participatory workshops across six European living labs located in Sligo, Gdansk, Badajoz, Zakynthos, Leipzig, and Bergen. Surveys captured contextual characteristics, focal action situations, and stakeholder configurations in each site, while workshops facilitated deeper exploration of actor roles, interactions, and perceived drivers of change. Preliminary findings highlight the importance of trust-building, inclusive participation, and locally relevant knowledge exchange as critical motivators for behavioural adaptation. Furthermore, institutional support, resource accessibility, and facilitation capacity emerge as key opportunity and ability factors shaping engagement outcomes. By advancing understanding of behavioural acceleration mechanisms within living labs, this research contributes practical insights for designing participatory climate adaptation initiatives and strengthening community resilience.

Presentation Type: Oral

Climate Change Impacts on Extreme Flood Events: Integrated Hydrological Modelling for the Crookstown River Basin, Co. Cork, Ireland

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Abstract:

Climate change is intensifying the frequency and magnitude of extreme hydrological events, necessitating robust assessments of future flood risks to support evidence-based adaptation planning. This study develops an integrated modelling framework to evaluate the combined impacts of climate change and land-cover dynamics on extreme discharges in the Crookstown River Basin, Co. Cork, Ireland. The methodology integrates the statistical downscaling of climate variables, quantile-based bias correction, land-cover modelling and prediction using artificial neural networks and cellular automata, hydrological modelling using the Soil and Water Assessment Tool (SWAT+), and extreme value analysis. Historical simulations (2021-2025) were used to establish the baseline condition, while future projections span from 2025 to 2030 to align with predicted land cover scenarios. High-resolution ($0.1^\circ \times 0.1^\circ$) climate projections from the Danish Meteorological Institute (DMI) Regional Climate Model (RCM) under the high emission RCP 8.5 scenario were downscaled to catchment scale for five key meteorological variables: precipitation, temperature, wind speed, relative humidity, and solar radiation using Support Vector Regression (SVR), and subsequently bias-corrected through quantile mapping. The historical model was calibrated using observed daily streamflow data, achieving a Nash-Sutcliffe efficiency (NSE) of 0.86 and a coefficient of determination (R^2) of 0.85. The calibrated model was subsequently modified with future meteorological and land-cover inputs to generate daily streamflow projections for 2025-2030 periods. Extreme value analysis based on the Generalized Pareto Distribution (GPD) was applied to derive flood quantiles for 2-, 5-, 10-, 25-, 50-, and 100-year return periods. Results indicate a considerable amplification of high-return-period floods (50 and 100 years) under combined climate and land-cover change when compared to the historical period. The proposed framework demonstrates the critical importance of incorporating climate change projections into flood risk assessment and adaptation strategies for Irish catchments.

Presentation Type: Oral

Mapping the Bioeconomy Education Landscape in Ireland: Identifying Gaps and Building Skills for a Circular Bioeconomy Transition

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Abstract:

The transition to a circular bioeconomy requires not only technological innovation but also the development of appropriate skills, systems-thinking capacities, and cross-sectoral understanding across society. This research practice project, developed collaboratively through the BEST (Bioeconomy Education and Sustainability Teachers) Network and the Circular Bioeconomy Education Centre (CBEC), funded by DAFM, presents the creation of a national database mapping bioeconomy-related educational provision in Ireland. The study systematically analyses courses, programmes and toolkits across formal and non-formal education, examining target audiences, curriculum alignment, accreditation pathways and explicit engagement with systems thinking and circular bioeconomy concepts. Attention is given to identifying structural gaps, including limited early years provision and fragmented teacher education pathways, to assess how effectively current educational structures support the skills and competencies required for Ireland's bioeconomy transition. By integrating research analysis with the development of an accessible educator-facing resource for educators and curriculum developers, this project aims to strengthen coherence between policy ambitions and educational practice. The findings contribute to ongoing discussions on how environmental education and teacher education can more effectively support interdisciplinary capacity building for sustainable and circular bioeconomy futures.

Presentation Type: Oral

Mapping Energy Poverty: From European Policy to Local Action in Ireland

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Abstract:

Energy poverty is a recognized public challenge and policy issue in the European Union (EU Commission (EU Parliament, 2023)). Energy Poverty describes a situation where households cannot afford essential energy services such as heating, cooling, lighting, and electricity for daily needs. Across the EU, survey data show that millions of people struggle to keep their homes adequately warm during winters. The problem is exacerbated by climate change – And the burden falls most heavily on low-income households, older people, single-parent families, and tenants living in poorly insulated buildings. In Ireland, these challenges take on a distinct spatial pattern. Many households rely on oil, gas, or electricity for heating. Ireland's ageing housing stock, dispersed rural population, and dependence on fossil fuel heating create distinct vulnerability patterns. Therefore, this study develops a framework grounded in geographical and spatial analysis to identify the locations of vulnerable households and to determine where energy poverty mitigation efforts can be most effectively targeted. This approach combines small-area census data (SAPS), Building Energy Rating (BER) records, information on primary fuel type, and relevant energy indicators within a Geographic Information System (GIS) to assess the energy poverty of a region. The datasets are harmonised and standardised to allow meaningful comparison, and a composite vulnerability index is then developed using transparent weighting procedures. Spatial statistical techniques, including measures of spatial autocorrelation and hotspot analysis, are applied to detect geographic clustering of vulnerable population groups. Through this study we demonstrate the use case of embedding geo-spatial modelling as an evidence-based approach to enhance the effectiveness of energy poverty mitigation strategies.

Presentation Type: Oral

Operational emissions and fuel transitions in farmed seaweed: implications for blue carbon assessments

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Abstract:

Blue carbon frameworks are increasingly including farmed seaweed systems as potential climate mitigation pathways due to their high productivity and influence on marine carbon cycling. However, cultivation-related greenhouse gas emissions are rarely integrated into blue carbon assessments, creating uncertainty around the net climate performance of farmed systems. While previous research has examined carbon sequestration pathways such as sediment burial and the formation of refractory dissolved organic carbon, operational emissions are insufficiently incorporated into production-scale evaluations. Farmed seaweed production involves multiple operational stages, among which vessel-based seeding, maintenance and harvesting require repeated fuel use and represent a significant emission source. This study quantifies vessel-related emissions in an Irish kelp-farming system using a life-cycle assessment (LCA) approach. The functional unit is one tonne of fresh weight harvested at farm gate, with system boundaries restricted to cradle-to-gate vessel operations in order to isolate maritime operational emissions. Baseline diesel-powered operations generate approximately 88 kg CO₂-eq per tonne of harvested material. Maintenance and grid-tensioning activities account for the largest share of emissions. Replacing marine diesel with alternative fuels, including biodiesel from animal fats, waste cooking oil, or hydrotreated vegetable oil, reduces emissions from this phase by 73–90%. These findings demonstrate that fuel choice is a decisive determinant of the climate performance of farmed seaweed systems. Investigating options for operational decarbonisation in blue carbon evaluations advances the assessment of the realistic mitigation potential of seaweed farming.

Presentation Type: Oral

Perennial ryegrass varietal selection for improved resilience to fungal disease as a climate adaptation strategy

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Abstract:

Projected increases in temperature and precipitation in Ireland are predicted to increase the incidence of fungal diseases such as Crown Rust (*Puccinia coronata*) and Drechslera in perennial ryegrass (*Lolium perenne*; PRG). Previous research has shown that PRG varieties exhibit significant differences in disease resistance. Consequently, the selection of resilient varieties represents a potential climate adaptation strategy by reducing disease incidence. A grazed plot experiment containing 27 PRG varieties was conducted at Teagasc Moorepark, Animal and Grassland Research and Innovation Centre, Fermoy, Co Cork. The varieties were replicated 4 to 6 times in a randomized complete block design with a total of 156 plots. Plots were visually assessed and grazed when average pre-grazing yield was 1,400 kg DM/ha for a total of 7 rotations. Nitrogen was limited throughout the study to induce disease, with a total of 120 kg N/ha applied. Rotation length was increased to 100 days in September to encourage disease development before the December harvest, when measurements were recorded. Disease severity was visually assessed by three independent observers and quantified as (% plot area infected × % leaf area affected). Herbage samples were collected using a mower and dried for 72 hrs at 60°C to determine dry matter yield (kg DM/ha). Significant varietal differences in disease severity were observed ($p < 0.001$). Disease severity ranged from 4.9% to 19% between varieties. This demonstrates substantial genetic variation in disease expression across the 27 varieties evaluated. While there was a difference in dry matter yield between varieties (1,479 - 2,358 kg DM/ha; $p = 0.001$), this difference was not explained by disease score ($R^2 = 0.015$; $p = 0.54$) indicating that variation in disease severity was not a significant factor influencing yield differences. However, these results show that varietal selection may remain important under increasing disease pressure to support sward resilience.

Presentation Type: Oral

Historical yield improvement trends for major tillage crops across Ireland relative to seasonal temperature and precipitation indices

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Abstract:

The emergence of high-resolution temperature and precipitation projections for the future climate in Ireland has prompted increased demand for crop simulation model evaluation studies to inform adaptation options for the agricultural sector. Trends for increasing crop yield over time, due to improved variety breeding and selection, or crop husbandry can affect the validation of some modelling methodologies. The aim of this study was to evaluate the consistency and importance of increasing temporal yield trends for major crops across Ireland, relative to associated seasonal temperature and precipitation summary indices. The average yield for 2000-2023 of winter wheat, winter barley, winter oats, winter oilseed rape, spring barley, spring oats, beans and peas recorded on a regional basis (seven counties) by specialist crop advisors was sourced from Teagasc and collated with seasonal temperature and precipitation climate indices from the ETCCDI database, sourced from Met Éireann, for synoptic stations within these regions for the corresponding period. A stepwise multiple regression analysis methodology was employed to determine the influence of temporal yields trends in addition to available climate indices on observed yield, with location included as a random effect. A strong increasing significant linear temporal yield trend in all evaluated crops, with the single exception of peas, highlighted the influence of yield improvement on Irish historical yield data. This factor was more consistently significant across crops than any individual climatic index. Coefficients for these linear temporal effects ranged from 0.05 (spring barley) – 0.08 (winter barley) t/ha/year. When significant climate indices were included, the regression model performance was strongest for cereal crops (RMSE <10% of mean) and weakest for legume crops (RMSE >13% of mean), possibly influenced by a reduced data sample size for legumes. These results highlight the importance of considering temporal yield improvement factors in crop model evaluation studies.

Presentation Type: Oral

Impacts of sowing date selection on Irish cereal yield simulations under future climate change

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Abstract:

This study investigated how sowing date selection influences model simulated grain yields for spring barley (SB) and winter wheat (WW) in Ireland. The APSIM Next Gen (for SB) and AquaCrop (for WW) models were selected and calibrated using observed crop development data. Simulations were conducted using two contrasting, commercially realistic sowing dates: WW (7-October and 7-November) and SB (15-March and 20-April) and analyzed using linear regression. Daily rainfall, temperature (minimum and maximum), and solar radiation of baseline period (1976-2005) and future high-emission scenario (2041-2070; RCP8.5) for the HadGEM2 climate model, were sourced for Oak Park, Carlow, Ireland from Met Éireann and ISIMIP2b, respectively. Differences in Concordance Correlation Coefficient (CCC) were observed between baseline and higher yielding future simulations (0.78 vs 0.47), suggesting minimal sowing date impact on baseline trends but notable effects on projection under future climate conditions. For SB, the baseline period simulations indicated a moderate relationship (CCC = 0.46) between simulations from contrasting sowing dates, which lessened under future scenarios (CCC = 0.30). These results indicate sowing date selection considerably impacts trends observed in model simulated WW and SB yield projections for future climate data in Ireland. Simulated reductions to growing season due to higher daily temperatures throughout and associated alterations in canopy radiation interception dynamics, coupled with increased biomass production depleting water resources more rapidly, increases the impacts of later sowing in simulations. Given projected high variability in future precipitation patterns and the associated likely variance in feasible cereal sowing dates, these findings suggest that integrating a soil water content model to drive sowing date selection is of major importance for crop model simulations assessing future climate impacts on cereals and informing adaptation strategies.

Presentation Type: Oral

RESCUE: Developing a Climate Change Adaptation Toolkit to Enhance Local Resilience in Ireland

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Abstract:

Climate change is increasingly affecting Ireland through more frequent and intense extreme weather events, including flooding, windstorms and heatwaves. While the National Adaptation Framework and the recently revised Sectoral Adaptation Plans set strategic direction, effective climate change adaptation must ultimately occur at the local level. Local Authorities (LAs) manage extensive built assets, including housing, emergency services infrastructure and transport networks, and are therefore uniquely positioned to implement adaptation actions that enhance resilience within communities. However, significant gaps remain in the availability of locally relevant resilience metrics, decision-support tools, and operational climate risk assessments to support adaptation planning in Ireland. The RESCUE project (Resilience Enhancement and Supportive Climate Change Adaptation Toolkit for Local Authorities) addresses this challenge by developing an interdisciplinary framework and digital toolkit to support LAs in assessing climate risks and identifying effective adaptation strategies. The research integrates regional climate projections with data on hazard, exposure and vulnerability in the built environment to develop resilience metrics tailored to the Irish LA context. A key innovation of the project is the transition from static risk assessments to dynamic climate risk assessments, enabling the incorporation of real-time environmental and building performance data to support operational decision-making. The project also investigates the role of nature-based solutions (NbS) for climate adaptation in the built environment. Through stakeholder engagement with LAs and communities, the research examines institutional barriers, governance challenges and opportunities for scaling NbS in Ireland. The resulting RESCUE Climate Change Adaptation Toolkit will provide LAs with a practical decision-support system to evaluate climate risks, test adaptation strategies and develop resilience roadmaps for their assets and communities. By bridging scientific research, digital technologies and policy needs, the project aims to strengthen climate resilience planning at the local level in Ireland.

Presentation Type: Poster

Herbage dry matter yield and species composition of novel grassland swards in their establishment year

Soliu O. Mustapha¹, [ORCID](#), Zoe C. Mckay¹, [ORCID](#) Helen Sheridan¹ [ORCID](#)

¹University College Dublin

Abstract:

Due to its many beneficial agronomic traits, perennial ryegrass (PRG; *Lolium perenne*) is the preferred grass species in many temperate areas. However, its performance is dependent on the availability of high levels of nitrogen (N). Such dependence on N has significant economic implications for farmers as well as environmental implications for the wider environment. Multispecies swards (MSS) comprised of grasses, legumes and forage herbs are increasingly recognised for their ability to maintain herbage production while reducing dependence on fertiliser N and potentially enhancing resilience under periods of water stress. However, the persistence of the herb component of MSS is limited. To address this, greater understanding of the implications of sward management on herb comp is required. Additionally, there may be herb species, other than those normally considered for inclusion within MSS, that offer enhanced levels of persistence while maintaining herbage yield and quality. Two plot (1.5 x 8m) experiments were established following a completely randomised design in July 2025 at UCD Lyons Farm (53°18'N, 6°32'W). Experiment 1 comprised three sward types: i) PRG, ii) PRG and white clover (*Trifolium repens*) and iii) MSS comprised of PRG, timothy (*Phleum pratense*), white clover, red clover (*T. pratense*), chicory (*Cichorium intybus*) and plantain (*Plantago lanceolata*), and two rotation lengths: 28 v's 35 days. Experiment 2 comprised six MSS sward types: i) As above, ii) Dandelion (DL; *Taraxacum officinale*) replacing chicory, iii) DL replacing plantain, iv) Festulolium replacing PRG, v) Lucerne (*Medicago sativa*) replacing WC, and vi) Festulolium and Lucerne replacing PRG and WC. All swards were harvested in October 2025 and investigated for their herbage dry matter (DM) yield and species contribution to this. Preliminary results showed similar DM yields across all plot types and all novel species established well. Data collection will continue over the 2026 and 2027 growing seasons.

Presentation Type: Poster with 5 min oral presentation

Advancing Regional Climate Resilience in County Louth: Findings from Phase 1 and Early Insights from Phase 2 of the CLIMAAX Programme

Jonathan Leather¹, Rory Sheehan²

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²Louth County Council, Dundalk, Ireland

Abstract:

County Louth is one of Ireland's most climate-exposed regions, with over half its population living within 5 km of the coast and key settlements concentrated in low-lying areas vulnerable to extreme weather. As part of the EU-funded CLIMAAX initiative, Louth County Council, working with Grant Thornton and M-CO, has finished the first phase of a coordinated climate risk assessment using data from across the EU and the CLIMAAX multi-risk framework. Phase 1 identified three priority climate risks for Louth: coastal and river flooding, heavy rainfall, and windstorms. Dundalk, Drogheda, Blackrock, Carlingford, and Ardee face notable exposure, and economic losses may rise by 30–60% by 2050. We expect heavy rainfall events to intensify and become more frequent, with historical 100-year events occurring every 50–70 years. Windstorm analysis indicates that, although overall storm numbers may fall, high-intensity events could occur up to 3.6 times more often, posing risks to infrastructure, homes, and essential services. The assessment also highlights socio-economic vulnerability across communities and establishes a robust baseline of hazard, exposure, and vulnerability that can now be refined with local detail. Phase 2, now underway, builds directly on these findings. It uses high-resolution local datasets, community knowledge, and sector-specific assessments to provide a more detailed, place-based picture of climate risk. Stakeholder engagement sessions across Ardee, Cooley, Dundalk, and Drogheda are gathering lived experiences and local insights to validate and contextualise the model. The integration of OPW flood studies, Met Éireann records, infrastructure inventories, and socio-economic data aims to produce an actionable, locally grounded climate risk profile. Together, Phases 1 and 2 will form the core evidence base for developing County Louth's adaptation strategy in Phase 3, ensuring that climate resilience measures are targeted, equitable, and tailored to the county's unique vulnerabilities and community needs.

Presentation Type: Oral

Session Theme: Biodiversity Conservation and Ecosystem Restoration.

The extent of damaging activities from dumping on commonage habitats across West Connacht.

Hugh Fitzpatrick¹, Amber Jay¹, Louise Duignan¹, Nicholas Fettes², Paddy Crushell¹, Mary McAndrew¹, Elizabeth Ryder¹ [ORCID](#)

¹ACRES West Connacht

²Department of Agriculture, Food and Marine

Abstract:

The Agri-Climate Rural Environment Scheme (ACRES) is Ireland's agri-environment scheme that integrates the continued support into farming practices for climate action, habitat restoration, and biodiversity conservation. Central to its approach is the transition from action-based prescriptions to results-based habitat scoring within ecologically sensitive landscapes. Commonage, typically uplands peatlands are shared grazing lands dominated by blanket bog and wet heath. These habitats are internationally significant carbon stores and biodiversity reservoirs. Under ACRES, these habitats are assessed using scorecards that evaluate ecological integrity, hydrological integrity, threats and future prospects, including an assessment of damaging activities, risk to quality of water bodies, erosion, presence of invasive species and damage due to peat extraction. Higher habitat scores correspond to improved ecological condition and increased payments, thereby incentivising farmers to adopt sustainable commonage management. A critical threat to habitat integrity is illegal dumping of domestic, garden, agricultural, or construction waste, some of which is out of the control of the commonage shareholders. Field data collected as part of ACRES habitat assessments reveal the scale and severity of the issue in the West Connacht region. Dumping introduces pollutants and microplastics, facilitates invasive species establishment and lowers habitat condition scores under the ACRES co-operation project assessments. Beyond immediate ecological harm, such activities undermine biodiversity conservation goals and impacts the collective perceived-value of shared commonage lands. By linking financial incentives to measurable ecological outcomes, ACRES co-operation reframes farmers understanding of the biodiversity value and ecosystem services of peatlands. The scheme demonstrates that sustainable land management, based on habitat quality scoring and collective responsibility, can simultaneously enhance farm viability, protect peatland ecosystems, and contribute meaningfully to national climate and biodiversity targets. In this context, safeguarding commonage peatlands from damaging activity such as dumping is a starting point of long-term ecosystem protection and environmental sustainability.

Presentation Type: Oral

Comparative Analysis of Ant Communities within Different Habitats of Western Ireland

Nataliia Kosiuk¹, [ORCID](#), Ronan Courtney¹, [ORCID](#), Audrey O'Grady¹ [ORCID](#),

¹University of Limerick

Abstract:

This study examines the biodiversity and abundance of ant communities across a range of biotopes in Western Ireland, including bogs, wetlands, forests, grasslands, Burren limestone grasslands, and coastal dune systems. The selected habitats represent varying degrees of anthropogenic influence, encompassing natural and semi-natural forests, farmed coniferous plantations, National Park grasslands, and intensively managed silage fields. To ensure representative sampling, more than 600 pitfall traps were installed across 32 study plots. Where feasible, sampling was supplemented with in-nest collections, route searches, and baiting techniques. The analysis revealed previously undocumented differences in ant assemblages among the region's biotopes. Sphagnum bogs exhibited the highest ant densities, while thermally favourable limestone grasslands and coastal dunes supported the greatest species diversity. Both semi-natural woodlands and afforested monoculture plantations showed relatively low myrmecological diversity; however, they differed in species composition and abundance, with higher diversity indices recorded in drier, sunnier mixed forests. Grasslands under different management regimes displayed marked variation in ant communities, with the richest assemblages found in limestone grasslands and a near absence of ants in intensively managed silage fields. Overall, this research explores the ecological patterns of Irish ant fauna and evaluates how varying levels of habitat management shape community composition and structure. The findings highlight the potential of ants as biological indicators for assessing ecosystem management practices and for guiding the development of more sustainable land-use strategies. Key words: myrmecological fauna, density, biodiversity, habitats, natural, transformed, level of anthropogenic management.

Presentation Type: Oral

Advancing aquatic biodiversity conservation, monitoring and innovation: Insights from EU-funded projects

Avril Hanbidge¹, [ORCID](#), Laureen Bascou¹, Mathilde Vidal¹, [ORCID](#), Annette Wilson¹, [ORCID](#), Marieke Reuver¹ [ORCID](#)

¹ERINN Innovation, Dublin, Ireland

Abstract:

European aquatic ecosystems are increasingly threatened by climate change, pollution, biodiversity loss and invasive alien species (IAS). Addressing these challenges requires coordinated interdisciplinary research, robust monitoring systems and effective pathways to translate science into conservation and restoration action. We play a central role in ensuring research delivers meaningful, real-world outcomes. Here we highlight three Horizon Europe projects and our role in accelerating their contribution to European biodiversity conservation and management. We lead stakeholder engagement, targeted communication, dissemination and exploitation activities that are essential for translating scientific outputs into policy and practice. AquaPLAN (Aquatic Pollution from Light and Anthropogenic Noise: Management of Impacts on Biodiversity) is a €2.6M 4-year project investigating the combined impacts of light and noise pollution on aquatic biodiversity and developing evidence-based mitigation strategies. GuardIAS (Guarding European Waters from IAS) is a €7M 3-year project developing a comprehensive invasion management framework spanning prevention, early detection, prioritisation, eradication and public engagement to manage and mitigate IAS in aquatic habitats. MARCO-BOLO (MARine COastal BiODiversity Long-term Observations: Strengthening biodiversity observation in support of decision making) is a €7.3M 4-year project building a coherent, interoperable long-term aquatic biodiversity observation system, strengthening Europe's capacity to monitor and restore aquatic health. Across these projects, we accelerate impact by implementing a systematic methodology that integrates dissemination strategies, results-driven pathways to impact and targeted knowledge transfer activities. This ensures complex scientific findings are accessible, usable and aligned with stakeholder needs, enabling their translation into real-world action by policymakers, industry and society. This approach enhances the uptake of monitoring data, supports evidence-based conservation decisions and ultimately contributes to the protection and restoration of Europe's aquatic ecosystems.

Presentation Type: Oral

Working towards a high-resolution hyperspectral database of blanket bog vegetation communities

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¹Trinity College Dublin

²National Parks and Wildlife Service, Dublin Ireland

Abstract:

Peatlands are a globally important ecosystem for carbon storage, biodiversity, and water quality regulation. Ireland contains an internationally significant portion of peatlands and 50% of the blanket bogs of European importance. High-quality baseline data are imperative for effective restoration plans, but detailed habitat condition assessment at the national scale is difficult. Increasingly, scientists use remote sensing technologies for rapid ecosystem assessment, but at present it is not possible to detect rapid vegetation changes across a blanket bog landscape that indicate its condition. In this proposed methodology, a handheld hyperspectral sensing instrument (field spectrometer) will be used to collect spectral response patterns from individual plant species within blanket bog habitats. Individual species will be grouped into plant communities following established classification systems (National Survey of Upland Habitats, Irish Vegetation Classification), and a spectral library of plant community occurrence across blanket bog landscapes will be generated. This spectral library, combined with ecohydrological data—water table depth and hydrochemistry—will form the basis of an ecotype classification system designed for scalable remote sensing. If successful, this project will produce a methodology capable of improving habitat condition assessment at the landscape and national scales for Irish blanket bogs.

Presentation Type: Poster with 5 min oral presentation

Conserving and restoring calcareous grassland in The Burren, Co. Clare, using the Old Irish Goat (*Capra aegagrus hircus*).

Brid Burke¹, Niamh Graham¹, Michael Gormally¹, Caitriona Carlin¹

¹University of Galway

Abstract:

Improved grasslands, which cover most of the Island of Ireland, generally have low biodiversity. Semi-natural grasslands of conservation value, such as dry calcareous grasslands, are currently in decline. A key factor in their decline is scrub encroachment, which is the focus of this study. This project will assess the effectiveness of the Old Irish Goat (a traditional primitive goat breed) to control scrub and restore species-rich grasslands in the Burren, Co. Clare. The overarching aim of this project is to develop a conservation management protocol that can be adopted in other areas of the country experiencing similar issues. This project aims to: 1. Determine the effectiveness of goat browsing to restore semi-natural grassland in scrub-dominated sites. 2. Evaluate the impact of conservation browsing by goats to maintain existing semi-natural grasslands. 3. Design, in conjunction with landowners, robust grassland conservation management strategies in the Burren. Goat grazing will be managed and monitored using Norwegian No Fence technology. Vegetation will be quantified using a mix of desk- and field-based survey methods, such as quadrats and transects, along with drones and orthophotography, which will provide up-to-date aerial imagery of vegetation at a landscape level. This allows comparisons across the years of the study. Fieldwork is due to commence in May 2026, starting with a trial to inform the survey methodology. This work aims to provide an alternative methodology for conserving grassland habitats in the Burren, reducing the need for chemical controls currently in use. This work is funded by the National Parks and Wildlife Service and supported by the Old Irish Goat Society.

Presentation Type: Poster

Practitioner perspectives on biodiversity-friendly farming practices across Europe: A bottom-up analysis of uptake and prioritisation.

Niall Walshe¹, Saorla Kavanagh¹, Meritxell Grau Butinyac¹

¹Teagasc - Environment, Soils and Land Use Department

Abstract:

To mitigate the decline in biodiversity, there is a growing need to increase the uptake of biodiversity-friendly farming (BFF) practices. Factors shaping the uptake of BFF practices and the perceptions of their effectiveness among farmers, foresters, and other agricultural stakeholders remain underexplored. This study adopts a bottom-up approach to examine what BFF practices are currently implemented on farmland in 12 European countries and how they are perceived, conceptualised, and prioritised by agricultural professionals in those countries. As part of the Horizon Europe project FarmBioNet, we conducted two cross-national surveys targeting farmers, foresters, advisors, researchers, and policymakers. Both surveys included a free-listing component enabling respondents to identify BFF practices implemented on their farms or within their regions. This provided information on both the uptake and the perceived popularity of the practices listed. Free-listed practices were inductively coded into 18 practice categories (e.g., flower strips, soil health, and input reduction). Analyses of the free-listing data reveals clear patterns in the salience of BFF practice categories across stakeholder groups and countries. “Soil health” was the most frequently listed category, highlighting the centrality of soil-improving practices to European agricultural professionals. In contrast, categories such as “invasive species control” were rarely mentioned, suggesting lower prioritisation. Respondents reported high confidence in the effectiveness of the practices they listed (mean = 8.01/10). Cross-country variation was also evident: Irish respondents most frequently prioritised “input reduction”, whereas respondents in Spain most frequently listed “soil health” practices. Ranking order further indicated perceived popularity, with consistently high-ranked categories interpreted as more widely valued. These findings demonstrate the value of bottom-up perspectives for revealing how biodiversity-friendly farming practices are prioritised and implemented by agricultural professionals across 12 European countries. Constructive biodiversity policy must move beyond uniform prescriptions and build on locally grounded priorities that practitioners implementing them consider effective.

Presentation Type: Oral

Does NbS Performance Drive Investment? Stakeholder Perceptions and Financing Mechanisms for Freshwater Restoration.

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¹Centre for Freshwater and Environmental Studies, Dundalk Institute of Technology

Abstract:

Managing freshwater systems has become a critical policy priority due to the growing threats from climate change, urbanisation, and agricultural intensification. Nature-based Solutions (NbS) have gained recognition as eco-innovative approaches capable of addressing these challenges. Despite this recognition, less than one per cent of global water and biodiversity conservation financing is channelled to NbS projects. The study examines stakeholder perceptions of NbS performance and sustainable financing pathways for mainstreaming and upscaling NbS in freshwater systems in Ireland. A sequential explanatory design was employed and data were collected through questionnaire surveys (n = 105) and semi-structured interviews (n = 9). Preliminary findings show positive perceptions of NbS performance, with scale of implementation being an important determinant of their effectiveness. While public financing remains the preferred financing pathway, it was deemed inadequate for covering lifecycle costs beyond initial implementation. The study identifies critical barriers in financing freshwater NbS projects, including financial architecture, institutional constraints, administrative challenges, and risk and uncertainty. Collaborative governance, societal acceptance, financial restructuring, and institutional integration were key enablers that facilitate successful financing. By examining the intersection of perceptions of NbS performance and financing mechanisms, the study makes an original contribution by proposing a context-specific financing framework that can be a valuable tool for policymakers and NbS practitioners seeking to design and implement interventions to strengthen resilience in riverine environments.

Presentation Type: Poster with 5 min oral presentation

Session Theme: Environmental Education

Mapping Bioeconomy Integration and Measuring Transition Readiness: A structural review of Environmental Sciences / Management degree programmes curricular in the context of Ireland's National Bioeconomy Strategy.

Daisy Odunze¹, Helena McMahon¹

¹Munster Technological University, Tralee, Ireland

Abstract:

The transition from extractive, fossil-based economic models toward regenerative bio-based systems is central to climate resilience, biodiversity recovery, and sustainable development. In Ireland, this transition is guided by the Ireland's National Bioeconomy Strategy 2023–2025, which emphasizes circularity, sustainable land use, ecosystem services, innovation, and cross-sectoral skills development. This study evaluates the extent to which environmental science/management degree programmes in Irish universities are preparing graduates for this systemic transition. A Transition Readiness Index (TRI) was developed using a module-count methodology. A programme was classified as “transition-ready” where at least 30% of total modules (including optional modules available within the degree structure) aligned with regenerative bio-based criteria. Qualifying modules were identified through learning outcomes and module descriptors referencing sustainability, ecosystem management, environmental monitoring, climate science, environmental biotechnology, nature-based solutions, bioeconomy applications, and applied conservation. Eleven undergraduate and eight post-graduate programmes across major Irish higher education institutions were analyzed. Results indicate that most programmes meet or marginally exceed the 30% threshold, demonstrating strong foundations in ecological science, environmental assessment, and field-based skills. Programmes integrating environmental engineering, sustainable agriculture, environmental biotechnology, restoration ecology, and nature-based solutions showed higher alignment with regenerative bioeconomy objectives. However, while environmental protection and monitoring are well represented, explicit integration of circular bioeconomy systems, industrial symbiosis, and regenerative production models remains comparatively limited. The findings suggest that Irish environmental science education is transitioning toward regenerative paradigms but is largely positioned within an environmental protection framework rather than fully systemic bioeconomic transformation. Strengthening interdisciplinary integration between ecological science, sustainable production systems, and innovation-oriented bio-based industries could further enhance graduate preparedness. This study provides a replicable methodology for assessing curricular alignment with national sustainability strategies and offers insights for curriculum reform in support of Ireland's evolving bioeconomy.

Presentation Type: Oral

Tales from the watering hole: How citizen science influenced an Irish farmers practice and aims to inspire behavioural change with landowners for water quality and river habitat improvement via the Cross border CALM (Catchment Action for Local Management) initiative on the Glyde.

Cathal Flood¹, Eline Koelman², Izzy Bishop³, Susan Hegarty⁴, Fiona Regan⁴, Peter Hoebe²

¹Inland Fisheries Ireland

²Earthwatch Europe

³University College London

⁴Dublin City University, Water Institute

Abstract:

Modern agricultural practices are a major driver of global biodiversity loss, with diffuse agricultural pollution identified as a leading pressure in many river catchments. Within the Newry, Fane, Glyde and Dee catchment, agriculture is the primary pressure in 67% of the 49 water bodies classified as “at risk” of failing to meet Water Framework Directive objectives. Despite increasing production demands, achieving a balance between agricultural efficiency and environmental sustainability remains a significant challenge, often exacerbated by a disconnect between farmers and policymakers. Farmer empowerment may form part of the solution, particularly through participatory approaches such as citizen science. Monitoring key indicators of ecosystem health, biodiversity, and water quality can enable farmers to better understand the environmental impacts of their land management practices. This direct engagement can foster curiosity, increase ownership of environmental outcomes, and support long-term behavioural change. This study presents a five-year farmer-led citizen science initiative in County Longford, involving continuous monitoring of water quality in tributaries of the Camoge and Black rivers. The dataset includes over 5,000 nutrient measurements recorded via the FreshWater Watch platform, complemented by targeted biosensor sampling. The research explores nutrient dynamics in relation to cattle access and land use practices, while also incorporating physical habitat and biological observations as monitoring capacity developed over time. The findings demonstrate the potential of farmer-led citizen science to contribute to improved understanding of catchment processes, support localised environmental management, and encourage positive behavioural change. This approach has clear relevance for collaborative initiatives such as the CALM (Catchment Action for Local Management) project, highlighting the role of landowners as active participants in addressing ecosystem degradation.

Presentation Type: Poster with 5 min oral presentation

From Education to Evidence: Engaging Communities in Freshwater Pesticide Monitoring through the CS Hydro Tool Kit

Chloe Martin¹, Rebecca Smith¹, Nicolette Sale¹, Isabel Cadena¹, Karolina Milenko^{1,2}, David O'Connor¹, Fiona Regan¹

¹Dublin City University, Dublin, Ireland

²Sintef, Oslo, Norway

Abstract:

Freshwater systems are increasingly impacted by pesticides and other contaminants of emerging concern (CECs), yet public understanding of chemical pollution and water quality monitoring remains limited. Strengthening environmental education techniques and community engagement is essential for fostering informed stewardship of water resources and encouraging collective responsibility for aquatic ecosystems. The CS Hydro toolkit addresses this challenge by integrating citizen science with structured environmental education and laboratory-based chemistry techniques within the STARDUST research project. CS Hydro was developed as a participatory monitoring tool enabling community members to engage directly in freshwater pesticide screening while contributing to scientific research. The kit and associated protocol are designed for ease of use while ensuring reproducible and standardised sampling procedures. Training is delivered through online sessions that educate participants on appropriate sample site selection, standardised water sampling techniques, and correct use of the tool, which is composed of readily available laboratory consumables. Emphasis is placed on accurate documentation through a GIS-based survey and data collection interface aligned with scientific quality standards. Written instructions and video tutorials support experiential learning and build participant competence and confidence in environmental sampling practices. Citizen participants undertake field sampling using the CS Hydro tool on site, after which collected samples are analysed in laboratories at Dublin City University (DCU) for a defined suite of pesticides. This hybrid model integrates community participation within a formal research infrastructure, enabling engagement with authentic scientific workflows while maintaining analytical rigor and quality control. The methodology was piloted during a coordinated cross-border water blitz in Ireland and Denmark, fostering collaboration between researchers and communities and strengthening understanding of pesticide pathways and hydroclimatic influences. By combining standardised monitoring protocols with participatory engagement, CS Hydro demonstrates how citizen science can serve as an effective environmental education strategy while contributing meaningfully to freshwater research and monitoring.

Presentation Type: Poster

Designing and implementing curricula for BE Sustainable Systems Engineering at UCD — challenges and lessons learned

Rajat Nag¹, [ORCID](#), Enda Cummins¹, [ORCID](#), Ronald Halim¹, [ORCID](#), Tamiris da Costa¹, [ORCID](#), Junli Xu¹, [ORCID](#), Tom Curran¹, [ORCID](#), Joseph Sweeney¹, [ORCID](#), Dimitrios Argyropoulos¹, [ORCID](#), Sharon O'Rourke¹, [ORCID](#), Xue Ning¹, [ORCID](#), Asli Coban¹, [ORCID](#), Anna Molter¹, [ORCID](#), Nick Holden¹, [ORCID](#), Annette Patchett¹, Eva Achata Gonzales¹, [ORCID](#), Paula Bourke¹ [ORCID](#)

¹University College Dublin

Abstract:

The newly launched BE Sustainable Systems Engineering at UCD School of Biosystems and Food Engineering (SBFE) was conceived to address urgent climate change preparedness, resource, and circular bioeconomy challenges through an integrated engineering lens. The programme was designed to combine core engineering science with systems thinking, life-cycle assessment, carbon accounting, renewable energy systems, and bioresource management, aligning with industry demand for green skills and Engineers Ireland accreditation standards. The development process followed a structured curriculum design framework encompassing needs analysis, definition of the curriculum challenge, curriculum research, constructive alignment, implementation planning and module-level evaluation. Stakeholder consultation included academic staff, industry partners, accreditation requirements and student feedback. Sustainability coordinators are among the fastest-growing roles in Europe. Graduates will support the development of renewable energy, water and waste management, and sustainable food production industries. Programme Outcomes were benchmarked against Chartered Engineer (with further learning) standards, and heat-mapping exercises were conducted to ensure coherence across modules and appropriate coverage of investigation, teamwork, communication, and engineering management competencies. Key challenges included balancing quantitative rigour (e.g. modelling, uncertainty analysis, LCA and ISO-aligned carbon accounting) with accessibility for diverse learners; embedding Universal Design for Learning principles; integrating problem-based and research-informed teaching; and ensuring workload realism in a sustainability-focused curriculum that must remain industry-relevant and future-proof. Iterative refinement was informed by student feedback, assessment redesign, and alignment audits. Lessons learned highlight the importance of early stakeholder engagement, explicit constructive alignment, transparent assessment design, and embedding flexibility without diluting academic standards. The programme demonstrates how sustainability-driven engineering education can be systematically designed to produce graduates capable of leading circular, climate-resilient, and data-informed system transitions.

Presentation Type: Oral

An Ghaeilge faoi Bhláth: Language, Land and Bioeconomy –Teaching Irish through Ecological Connection

Aisling Uí Fhloinn^{1,2,3,4}, [ORCID](#), Máire Nic an Bhaire^{1,2,3} [ORCID](#), Laoise Ní Chléirigh^{1,2,3} [ORCID](#)

¹Maynooth University,

²Bioeconomy Education and Sustainability Teachers (BEST) Network,

³BiOrbic (Ireland's National Bioeconomy Research Centre), Dublin, Ireland

⁴Grow It Yourself (GIY), Waterford, Ireland

Abstract:

This PhD project proposes to investigate how bioeconomy-informed educational principles can support Irish language literacy in primary education. Drawing on the Bioeconomy Education Framework, developed by the Bioeconomy Education and Sustainability Teachers (BEST) Network (Nic an Bhaire et al., 2026), the study conceptualises language acquisition as an ecological process shaped by engagement with land, food and community. The research will be conducted in five Gaelscoil settings and will be supported by the Grow It Yourself (GIY) programme, in collaboration with BiOrbic (Ireland's National Bioeconomy Research Centre) and the BEST Network. Through the coordinated provision of school grow kits, professional learning for teachers, and curriculum-aligned educational resources, the project conceptualises food growing as relational, place-based pedagogy intended to investigate whether fostering the children's interconnectedness with land and ecological systems contributes to enhanced literacy development. While school gardening has been shown to support children's wellbeing and learning, limited research has examined its potential to enhance Irish language literacy or to explicitly connect language education with bioeconomy principles. This study aims to address that gap by exploring how ecological, food-based learning environments may foster authentic language use and literacy development in Irish-medium settings. The project aligns with Ireland's Education for Sustainable Development 2030 Strategy and contributes to ongoing discussion regarding innovative pedagogies for Gaeilge and teacher professional development. By examining the relationship between language, land and sustainable systems, this research seeks to demonstrate how bioeconomy-informed, place-based education can strengthen Irish literacy while deepening students' ecological awareness.

Presentation Type: Poster

Environmental Education for Empowerment – A Response to Eco-anxiety Among Young People in Ireland

Stephanie Woods¹, Suzanne Linnane¹, Aine McHugh¹, Caroline Gilleran Stephens¹

¹Centre for Freshwater and Environmental Studies, Dundalk Institute of Technology

Abstract:

Rising awareness of climate and biodiversity crises, alongside heightened media attention and public discourse, has been associated with increasing levels of eco-anxiety among young people. Although learning and changing behaviour have always been the main goals of environmental education, its ability to promote emotional resilience and agency has received less attention. Grounded in a participatory co-design approach, this study investigates how environmental education in Ireland can cultivate agency and emotional resilience in the context of eco-anxiety. Using an interactive, student-led, co-design methodology rather than a conventional mixed-methods design, the first stage of this study comprised interviews with 9 teachers, along with questionnaires and focus groups with over 150 secondary school students from 5 different schools (specifically the Transition Year cohort), as embedded elements of the co-design process through which participants actively contribute to shaping the research direction and programme development. It examined how young people learn about the environment, how they feel about environmental issues, and how they think educational methods could better encourage action competence, hope, and group efficacy. Analysis of student responses revealed some presence of overwhelm, frustration, and powerlessness particularly during discussions of climate change. However, participants also expressed a strong desire for learning experiences that are place-based, action-oriented, and interactive. Students highlighted discussion-based learning, critical thinking, and collaborative projects as practical ways to translate climate-related concerns into action. This study could contribute to the growing body of research that connects transformative environmental education, youth empowerment, and eco-anxiety. It is exploring an approach to environmental education in Ireland that incorporates community-based action, participatory pedagogy, and emotional literacy.

Presentation Type: Poster with 5 min oral presentation

Toward Regenerative Festivals; salutogenic celebration for holistic well-being.

Aminah Dastan¹

¹Dundalk Institute of Technology

Abstract:

Principles of the regenerative tourism paradigm can be operationalised through the cultural, creative and transformative capacities of festivals. Ethnographic findings from seven small-scale Irish festivals provide initial data of a shift toward regenerative festival design. Creating opportunities to decentralise multi-disciplinary festival forms, aligning socio-ecological, cultural and heritage reproduction for the distribution of health and well-being across networks. Participation and reflexive feedback from bottom-up community sources inform net-positive stakeholder relationships, integrating living systems principles in the celebration and embodiment of the nascent yet pivotal conceptualisation of the ecocene. This chapter situates festivals as potential agents of systemic healing and cultural revitalisation. Going forward, the future design of festivals as a continuum of the emerging regenerative paradigm will require further trans-disciplinary engagement across related sectors and research over time.

Presentation Type: Oral

Session Theme: Circular Bioeconomy, Waste Management, and Bioenergy.

Shaping a Circular Nutrient Future: Co-Created Policy Instruments for Ireland's Recycled Fertiliser Market

Anthony Oyeogbe¹, Niamh Power¹

¹Munster Technological University, Cork, Ireland

Abstract:

Transitioning to a circular nutrient economy can mitigate dependency on finite resources and reduce the energy intensity of conventional fertiliser production. However, systemic market failures impede this transition in Ireland. This study employed a participatory, bottom-up workshop methodology, engaging a quadruple helix of stakeholders to analyse barriers and co-design solutions for the recycled fertiliser sector. Structured co-design exercises identified key obstacles, including knowledge and trust deficits, price distortion, regulatory complexity, and a weak social license. In response, three complementary market mechanisms were formulated: (1) an Anaerobic Digestate Platform to monetise ecosystem services via verified performance data; (2) a True Carbon Value Framework incorporating carbon pricing to level the economic playing field; and (3) a National Recycled Nutrient Obligation Scheme mandating minimum recycled content to secure demand. The findings underscore the interdependent supply-demand dynamic and propose that integrated implementation of these mechanisms, supported by regulatory simplification and strategic communication, can de-risk investment and accelerate the development of a sustainable, indigenous circular nutrient economy.

Presentation Type: Oral

Social Life Cycle Analysis of the Bioeconomy Development: A systematic review

Oksana Avendano Flores¹, Egle Gusciute¹, Fionnuala Murphy¹

¹University College Dublin

Abstract:

The transition to a bioeconomy is becoming a priority for many nations, yet its social impacts remain under-researched. Social Life Cycle Assessment (S-LCA) provides a structured framework for evaluating the social impacts of products and systems throughout their life cycles. Nevertheless, its application in the bioeconomy is still emerging, facing challenges such as context-specific indicators, inconsistent methodologies, and limited local data availability. The main goal of this research is to provide a systematic overview of how S-LCA has been used to assess social sustainability in bioeconomy-related systems in Europe. The specific objectives are to identify methodological trends and gaps in applying S-LCA, evaluate the social indicators and stakeholder categories most frequently addressed, and assess the degree of compliance with S-LCA guidelines. The PRISMA framework was followed. Searches were conducted in Scopus and Web of Science, with inclusion criteria focusing on European studies published after 2015 that explicitly apply or discuss S-LCA within a bioeconomy context. Each paper was analysed for: journal, country of assessment, application case, methodological approach, data sources, functional unit, system boundaries, stakeholder groups, and social indicators. Germany and Spain account for most S-LCA applications in the bioeconomy. “Workers” dominate as the main stakeholder category. Most studies use the Reference Scale Approach, though often without explicit mention. Several papers lack defined boundaries or omit functional units entirely. Indicators are highly heterogeneous, with many studies using non-standard or broad categories (e.g., “health and safety”) rather than measurable indicators. Only a minority fully follow the UNEP-SETAC (2020) guidelines, complicating cross-study comparisons. This review finds that S-LCA applications in the bioeconomy remain methodologically inconsistent and scarce, limiting their utility for informed decision-making. The absence of standardised indicators and boundaries undermines comparability and policy translation. A more coherent and context-aware S-LCA practice will strengthen the scientific foundation for a just bioeconomy transition.

Presentation Type: Oral

FOLOU: Quantifying Food Waste and Food Loss in the Primary Production sector of Meat and Dairy in Ireland.

Caoimhe Grace¹, Dan O'Sullivan¹, J.J. Leahy¹

¹University of Limerick

Abstract:

Food loss and food waste (FLW) in primary production remains under-quantified within high-income, export oriented agri-food systems. In Ireland, where meat and dairy sectors play a central economic and environmental role, robust measurement at farm level is limited by definitional ambiguity, fragmented data sources, and the biological variability inherent to livestock systems. Building on prior research examining methodological gaps in FLW accounting and comparative analysis with Flanders (Belgium), this study develops a structured framework to quantify and characterise food loss and food waste in Ireland's meat and dairy production systems. The research integrates mixed methods; including farm-level case studies, secondary data analysis, and material flow mapping aligned with EU reporting requirements. Attention is given to distinguishing between unavoidable losses (e.g. animal mortality, disease-related disposal etc.) and potentially avoidable waste (e.g. management related inefficiencies). The framework accounts for losses occurring pre-harvest (on-farm mortality, fertility failure), post-harvest but pre-processing (carcass condemnation, milk rejection), and product diverted to non-FSC or non-food uses. Preliminary findings have indicated that data availability and definitional inconsistencies significantly influence reported FLW levels, underscoring the need for harmonised metrics tailored to primary production. The study highlights critical loss hotspots linked to animal health, weather variability, and market specifications, while also identifying opportunities for improved data capture through integration with existing national databases. By advancing a transparent, reliable, and replicable quantification framework, this research contributes to improved national reporting, supports evidence-based mitigation strategies, and facilitates cross-regional comparison within the EU/EEA. Ultimately, it strengthens the foundation for reducing food loss and waste in livestock systems, while balancing productivity, sustainability and animal welfare considerations. This research forms part of an EU-funded initiative aimed at developing harmonised methodologies for quantifying food loss and waste across primary production sectors, with application beyond livestock commodities. FOLOU Webpage

Presentation Type: Poster with 5 min oral presentation

Evaluation of the R-phycoerythrin pigment from *Furcellaria lumbricalis* for application in cosmetic formulations

Olayinka Franklyn Allison¹, John Mackrill², Tanel Ilmjärv³, Adriana Cunha Neves¹, Indu Muraleedharan Nair¹

¹South East Technological University, Carlow, Ireland

²University College Cork, Cork, Ireland

³Vetik, Saaremaa, Estonia

Abstract:

Abstract Due to increasing concerns regarding the toxicity and environmental impact of synthetic colourants, there is growing interest in the use of sustainable marine-derived pigments in cosmetic formulations. R-phycoerythrin (R-PE) is a naturally occurring red phycobiliprotein found in red seaweed such as *Furcellaria lumbricalis*. The strong red hue and the pigment's water-solubility could be exploited as a sustainable cosmeceutical ingredient. The current study evaluated the suitability of R-phycoerythrin extracted from *Furcellaria lumbricalis* for use in cosmetic formulations. The structural characterisation of the pigment was confirmed with the FTIR and SDS-PAGE analysis for the functional subunits of the phycobilin chromophore system. The pigment was assessed for solubility in different solvents with the best solubility observed at pH7 in water. The temperature stability and light sensitivity data showed substantial thermal stability over 40 °C to 400 °C and a ~25% susceptibility to photodegradation at lower concentrations. The pigment showed significant invitro antioxidant activity with the FRAP assay and the DPPH radical scavenging activity of 72.88% at 20ug mL⁻¹. The pigment, both in free form and in formulation, showed strong antimicrobial activity against *Pseudomonas fluorescens*, *Pseudomonas aeruginosa*, *Bacillus cereus* and *Staphylococcus epidermis* with a minimum inhibitory concentration of 20ug mL⁻¹. The cytotoxicity studies were performed with HACAT cells using the resazurin reduction assay and showed 85.77% dermocosmetic potential for the pigment. Prototype formulations for a face mask, hand cream, and lip tint were developed with the R-PE pigment to serve as cosmeceuticals, balancing health benefits with beauty standards. In summary R-phycoerythrin proves to have significant potential to be used as a natural colourant and multifunctional ingredient in sustainable cosmetic product development.

Presentation Type: Oral

Hydrothermal carbonisation as a key step in a cascading biorefinery for valorisation of strongly alkaline residues after biostimulants extraction

Anna Kaskova¹, Marzena Kwapinska¹, Witold Kwapinski¹, J.J. Leahy¹

¹University of Limerick

Abstract:

The CircBioCityWaste project investigates pathways for converting urban biowaste into bio-based products to support sustainable agriculture. After the extraction of biostimulants from the different biowaste streams, the residual material requires a use. This study examines hydrothermal carbonisation (HTC) as a potential follow-up step to produce a solid fertilising product from residues arising from KOH extraction of two digestate streams: dairy factory and municipal wastewater digestate. Extraction produced alkaline (pH>11) high-moisture residues: 86% H₂O in dairy digestate residue (DDR), 79% in municipal wastewater digestate residue (WWR). Both had elevated K levels (42 g/kg) and high P concentration (20 g/kg in DDR, 32 g/kg in WWR). HTC was selected for its suitability for wet feedstocks and mild operating temperatures. HTC produces slurry, which can be separated into a solid hydrochar and liquor, and small quantities of gas. Laboratory-scale HTC was conducted in a 1 L reactor at 180 and 220°C for 1 hour. The mass balances were calculated, and the products were characterised. HTC at 180°C did not improve the residue dewatering, but an increase to 220°C enabled recovery of 11 (DDR) and 4 (WWR) times more liquor. The pH (7.4-8.5) of the liquors had decreased due to fatty acids and ammonia release. For 220°C liquors 4.5 and 4.9 g/L of total organic acids, and 2.2 and 1.4 g/L of ammonia were observed from DDR and WWR, respectively. All hydrochars were nutrient-rich, but the heavy metals (Cu, Ni, Pb) content of the WWR hydrochars was high for fertilising application. Hydrochar obtained from DDR at 220°C produced an NPK ratio 6-9-2 and low levels of heavy metals and would require further plant-growth testing. This research may contribute to adapting HTC as a step in biorefineries for production of bio-based fertilisers from high-moisture waste sources.

Presentation Type: Oral

Effects of recycling derived fertilisers versus conventional fertilisers on soil nematode communities in Irish wheat field trials

Lilian Atira¹, [ORCID](#), Thomais Kakouli -Duarte¹

¹Southeast Technological University

Abstract:

Ensuring environmental sustainability in agriculture depends on humanity's ability to manage soil not only for maximum crop production but also as a living system. This study explored the comparative effects of recycling derived fertilisers (RDFs) versus conventional fertilisers on soil health. This research was based on two winter wheat trials carried out at the Teagasc Oak Park research facility in Carlow, Ireland, in 2024 and 2025. Nematode communities served as bioindicators of soil health, with a focus on total abundance and nematode diversity as key indicators of change. In 2024, treatments included phosphorus testing RDFs, such as digestate, digestate + struvite, and struvite, all combined with mineral potassium. A mineral fertiliser blend was used as a positive control, while another treatment without phosphorus plus mineral nitrogen served as a negative control. In 2025, the treatments included testing RDF digestate combined with mineral potassium and a blend of mineral fertilisers as a positive control. There were also two negative controls: one receiving mineral nitrogen without phosphorus and the other receiving synthetic phosphorus without nitrogen, for a total of 4 treatments. Both morphological and molecular techniques were utilised for nematode analyses. It was found that in both years, the application of RDFs did not significantly affect nematode abundance compared with conventional and negative control fertilisers. Furthermore, nematode alpha- and beta-diversity analyses revealed that community composition remained similar across treatments, with no statistically significant differences. Over the two years, results showed that RDF fertilisation did not disrupt the nematode community structure; these findings highlight the potential of RDFs as sustainable alternatives to conventional mineral fertilisers.

Presentation Type: Oral

Optimising sulphur nutrition of a grass-white clover sward increases apparent biological nitrogen fixation and reduces nitrate leaching in the local bioeconomy

Dónal Kinsella^{1,2}, [ORCID](#), Imelda Casey², [ORCID](#), Patrick J. Forrester¹, [ORCID](#)

¹Teagasc Crops, Environment & Land Use Programme, Johnstown Castle, Ireland

²Department of Land Science, South-East Technological University

Abstract:

White clover, when sown in association with perennial ryegrass, is a biological alternative that can reduce imported mineral fertiliser nitrogen (N) reliance via biological nitrogen fixation (BNF). However, optimising N fixation by clover on the farm poses a challenge, with little research existing on the role of sulphur (S) optimisation. The objective of the study was to test the effect of increasing S fertiliser rates on herbage yield and N off-take in crop dry matter (DM) at two levels of inorganic N supply, zero and 150 kg ha⁻¹ yr⁻¹, and to assess the impact of S application on NO₃⁻-N leaching. A soil lysimeter study was conducted at Johnstown Castle on a free draining soil. Treatments, except for the control, received 150 kg N ha⁻¹ yr⁻¹ in the form of cattle slurry (CS) in two split applications. Sulphur was applied to inorganic N treatments at 0, 15, 30 and 45 kg S ha⁻¹ with a 60 kg S ha⁻¹ treatment included at the higher N rate. Where zero inorganic fertiliser N was applied, 15 kg S ha⁻¹ with CS maximised yield at 12425 kg DM ha⁻¹, increased N-offtake by 41 kg N ha⁻¹ and reduced NO₃⁻-N leaching by 28%. With 150 kg inorganic N ha⁻¹ input, 45 kg S ha⁻¹ along with CS maximised yield at 14041 kg DM ha⁻¹, increased N-offtake by 80 kg N ha⁻¹ and reduced NO₃⁻-N leaching by 34%. With the inclusion of S on the zero inorganic N + CS treatment, apparent BNF went to a high of 293 kg N ha⁻¹ at 30 kg S ha⁻¹. However, high S application (60 kg S ha⁻¹) had a negative effect on yield, N-offtake and NO₃⁻-N leaching loss. Optimised S nutrition in ryegrass-white clover swards has benefits, but advice should be refined to ensure the optimal level is not exceeded.

Presentation Type: Oral

Textile Waste Management in Ireland: A PESTEL-SWOT Analysis for Sustainable Transition

Shwe Yie Lin¹, [ORCID](#), Joseph Coughlan¹, [ORCID](#), Gaurav Rajauria², [ORCID](#), Anushree Priyadarshini¹, [ORCID](#)

¹School of Business, Maynooth University,

²School of Food and Nutritional Sciences, University College Cork

Abstract:

High per-capita textile consumption and disposal, alongside low reuse, underdeveloped recycling facilities, and fast fashion norms overburdens Ireland's waste management system, highlighting a need for a shift toward sustainable textile waste management. As textiles receive growing attention in circular economy policy, the country-level conditions for this transition should be assessed. This study therefore examines macro-environmental factors shaping this transition through a Political, Economic, Social, Technological, Environmental, and Legal (PESTEL) analysis, which is subsequently organised into a Strengths, Weaknesses, Opportunities, and Threats (SWOT) framework to categorise the findings into enablers and barriers. The analysis draws on evidence from European Union and Irish policies, directives, and regulations, alongside peer-reviewed literature. Ireland's governance framework is well aligned with EU policies, regulations and directives. It has an import-dominated textile supply, emerging circular business models such as reuse, and could gain significant economic and social benefits from managing textile waste more sustainably. High textile consumption and disposal, a value–action gap regarding product durability, strong trust in donation, and increasing engagement in repair and second-hand use are social drivers. Ireland faces deficits in domestic sorting, recycling capacity, and data infrastructure. Environmental impacts arise from high textile use, textile waste, and pollution across the textile value chain, including microplastic emissions. The SWOT synthesis identified strengths such as a robust charity and social enterprise led reuse ecosystem and growing openness to circular retail, and weaknesses including persistent fast fashion norms, repair skill gaps, and limited sorting and recycling, sending most textiles to landfill or incineration. Opportunities include Extended Producer Responsibility, Digital Product Passports, behaviorally informed campaigns, and digital reuse ecosystems. Threats include tight timelines, technological lock-in, fast fashion resistance, illegal or misclassified exports, and risks from synthetic fibre. The study maps Ireland's transition conditions and highlights actionable levers for a more sustainable textile waste management system.

Presentation Type: Oral

Pre-treatment strategy to valorise cotton-rich textile waste into fermentable sugars for bioconversion

An Hoang Luu¹, John Morrissey¹, Vijai Kumar Gupta², Manimaran Ayyachamy³, Anushree Priyadarshini⁴, Gaurav Rajauria¹

¹University College Cork

²Dublin City University

³Marigot Ltd, Co. Cork, Ireland

⁴Maynooth University

Abstract:

Textile waste generation represents a critical global concern, necessitating circular bioeconomy valorization pathways. In Ireland, post-consumer textile discards total approximately 110,000 tonnes annually, while Europe produces around 5.7 million tonnes across the region (Environmental Protection Agency; European Environment Agency). Cotton-rich textile residuals are an abundant cellulosic resource, offering a promising feedstock for sustainable bio-based material production. In this study, white cotton-based textile material was employed to investigate the bioconversion of cellulose via physicochemical pretreatment followed by enzymatic saccharification to fermentable sugars. Shredded cotton textiles were first subjected to alkaline (NaOH) pretreatment and subsequently to acid (HCl) hydrolysis, after which the pretreated substrates underwent enzymatic saccharification. Critical process parameters (temperature, time, chemical concentration, and solid loading) and their interactions across both pretreatment stages were systematically evaluated using a fractional factorial design. Subsequent central-composite response surface methodology was employed to identify optimal conditions to maximize the enzymatic hydrolysis yield. Pretreatment efficacy was assessed via structural regenerations, including cellulose accessibility and crystallinity indices, characterized by FTIR spectroscopy, alongside cellulose conversion efficiency measure through enzymatic hydrolysis yield. Results demonstrate saccharification yields of 70.71% (w/w) from white cotton textiles, establishing a validated framework for textile waste valorization, supporting insight for circular bioeconomy principles through waste-to-value strategies in the textile sector.

Presentation Type: Oral

Impulse Responses of Biogenic CO₂ Potential Supply and Fossil CO₂ Consumption: A Panel VAR Approach considering nine EU Countries

Hongkun Zhu^{1,2}, Valeria Andreoni¹, Bernadette Power¹, Tracy Bradfield¹, David Wall^{1,2}

¹University College Cork, Ireland

²Sustainability Institute, Cork, Ireland

Abstract:

Biogenic carbon dioxide (CO₂) is carbon that already exists in the carbon cycle and can be considered a valuable resource if captured and re-utilised. For example, biogenic CO₂ from anaerobic digestion processes can be captured for use in sectors currently using fossil CO₂ sources, such as in industrial applications or advanced fuel production. Such strategies can assist the EU in achieving its climate-neutrality goals by 2050 and in implementing circular-economy approaches. This paper aims to compare how biogenic CO₂ potential supply and fossil CO₂ consumption respond dynamically to policy support, energy taxes, renewable energy share, and economic growth shocks. The analysis accounts for three stages: firstly, panel unit root and panel cointegration tests are conducted; secondly, panel vector autoregression (Panel VAR) models are estimated; and thirdly, the impacts of economic, policy, and energy structure shocks are evaluated on biogenic CO₂ potential supply and fossil CO₂ consumption through impulse-response functions (IRF) and variance decomposition analysis. Based on these results, projections can be made. It is anticipated that positive shocks of policy support, renewable energy share, and fossil CO₂ consumption will significantly increase biogenic CO₂ potential supply, compared to energy taxes and economic growth. Furthermore, policy support and the share of renewable energy are anticipated to play a greater role in long-term fluctuations in the potential biogenic CO₂ supply. This study innovatively expands the concept of biogenic CO₂ from a purely theoretical resource potential to an economically defined supply potential. It also addresses a central question in the carbon cycle economy: whether biogenic CO₂ can be developed at such a scale to provide a viable substitute for fossil CO₂, and which policy and market factors determine its supply. The findings will provide empirical evidence to support policymakers create policy instruments that can effectively develop biogenic CO₂ supply chains and promote circular economy principles.

Presentation Type: Oral

Developing circular economy systems and new KPIs to promote green hydrogen production and other co-product and by-product utilisation in the water and wastewater sector

Michelle McMullan¹, Danielle Soban¹, Jelena Vlajic¹, Mahamad Yousif¹, Beatrice Smyth¹
¹Queen's University Belfast, United Kingdom

Abstract:

The goal of this research is to develop a novel KPI-centred roadmap for the water industry that integrates sustainable 'green' hydrogen and circular pathways. As very large energy consumers, the water sector is a significant carbon emitter and is being challenged to reduce harmful atmospheric emissions, energy usage and operating costs in tandem. There is a major risk that the climate is changing faster than water and wastewater capital infrastructure can be built, and that change within water organisations is driven by key performance indicators (KPIs). However, there are currently limited KPIs in use that are specific to the circular economy and new 'green' technologies. The lack of such indicators presents a barrier to progress, and the overarching aim of this research is therefore to develop and trial bespoke circular economy KPIs that are compatible with the proposed system and thus be used to transform workforce and industry behaviour. A mass and energy balance and quantification of flows was carried out at a proposed 50,000 population equivalent activated sludge wastewater works integrating water electrolysis (1MW PEM electrolyser) and 'green' hydrogen technologies to identify and quantify 'circular' pathways for co-product and by-product utilisation. This identified core circular pillars that demonstrate resource recovery, optimisation, circularity, efficiency and 'added value' within the overall plant system. These pillars are being used to inform the development of KPIs. The results indicate that transiting to a green hydrogen circular economy can sustainably revolutionise and energise water and wastewater services. Integrating 'green' hydrogen technologies into existing operations can increase energy security and independence, as well as provide valuable co-products and by-products, such as oxygen, that can increase the capacity at treatment facilities. The selection and testing of KPIs to support these measures will be outlined, and opportunities for future implementation will be discussed.

Presentation Type: Poster with 5 min oral presentation

Implementation of a green biorefinery pilot-plant for the processing of Irish green biomass into value-added products.

Megan O'Brien¹, Jagdeep Kumar Nayak¹, Joanna Przyborska¹, James Gaffey¹, Joanna Tierney¹, Helena McMahon¹

¹Munster Technological University, Kerry, Ireland

Abstract:

Green biorefinery is a process that converts grassland and residual green biomass into a spectrum of sustainable products, including food and feed materials, biomaterials, fine chemicals, bioenergy, and fertilisers. Work has been undertaken in Ireland and other EU countries to show the potential of these technologies to enhance the protein, material and nutrient efficiency of Europe's 34 million ha of grasslands. In 2025, Munster Technological University installed Ireland's first pilot-scale green biorefinery system, with a processing capacity of 100 kg of fresh biomass per batch. The process begins by shredding the biomass to increase density and improve handling. The shredded material is then pressed using a screw press, separating it into a fibrous press cake and a liquid green juice. The juice passes through a vibrating sieve to remove remaining suspended solids before being collected in a stainless-steel tank. It is then heated to coagulate soluble proteins, after which a decanter centrifuge separates the protein fraction as leaf protein concentrate (LPC). The remaining liquid, known as brown juice, is discharged for further use. Initially, the system processes fresh and ensiled grass-clover mixtures, with plans to expand to multi-species swards and residual plant and marine feedstocks. To optimize plant performance, different feedstocks and processing conditions are evaluated based on dry matter, crude protein, ash, fibre and carbohydrate content. Future development includes downstream processing to create higher-value products and scaling the technology at a demonstration green biorefinery and anaerobic digestion platform at Farm Zero C in Bandon, Co. Cork. Current research includes producing volatile fatty acids from brown juice for use as sustainable pig feed additives, reducing reliance on zinc oxide and antibiotics.

Presentation Type: Poster

Sensitivity Analysis of Construction Timber Climate Change Impact Displacement Factors for Irish Residential Scheme Buildings

William Horan¹, [ORCID](#), David Styles², [ORCID](#), Michael Quilligan¹, [ORCID](#)

¹University of Limerick

²University of Galway

Abstract:

To date, policymakers in Ireland have been reliant on international building archetype proxies to inform estimation of wood use material intensity for Irish buildings, and the associated substitution potential of carbon-intensive products such as concrete and steel. In this study comparative nationally representative Timber Frame (TF) and Masonry Frame (MF) residential scheme housing bill of quantity volumetric data from industry architectural drawings, were coupled with ECO Platform Environmental Product Declarations (EPD) material density, GWP emissions and biogenic storage values for each building material. Monte Carlo simulation analysis (i.e. 1000 runs per material) was performed to estimate the GWP emission displacement potential of construction wood, with global and local sensitivity analyses conducted on each input materials influence on output displacement factors. Upfront product (A1–3) module displacement factors ranged from -0.254 to +1.18 kgCO₂e/kgCO₂e biogenic, with a mean of 0.376. Regression based global sensitivity analysis identified MF concrete block as the greatest influence on determining displacement factor, (r^2 of 0.738), followed by TF concrete block (r^2 of 0.136), and MF rigid insulation (r^2 of 0.0822). One-at-a-time local sensitivity analysis found that min-max variation of masonry block in MF resulted in displacement factors ranging from -80.6 to +129% relative to the mean, followed by TF concrete block of -54.3 to +33.7%, and MF insulation of -25.5 to +31.2%. Accounting for End-of-Life (C) and beyond the system boundary (D) modules, the whole life cycle displacement factors (A+C+D) displacement factors range from -0.384 to +1.21 kgCO₂e/kgCO₂e biogenic, with a mean of 0.341. There is currently significant uncertainty surrounding End-of-Life destinations and nationally representative next system process models for construction waste in Ireland with the need for better national data collection efforts to inform more robust LCA calculations and scenario modelling

Presentation Type: Oral

Circular Bioeconomy as Reharmonisation: Interpreting the Double Spiral as Right Relationship Between Economic Activity and Natural Cycles

Daragh Cogley¹

¹Maynooth University, Kildare, Ireland

Abstract:

Sustainability strategies in Ireland are often framed through technology, innovation, and resource efficiency. This poster advances a complementary framing: the circular bioeconomy as re-synchronising economic activity with natural cycles in order to repair the socio-ecological rift between first nature (ecological rhythms, limits, and habitats) and second nature (institutions, markets, infrastructures, and everyday practices). The central claim is that circularity is not only a technical design principle but also a cultural and educational challenge. Unless communities and institutions re-align economic activity with seasonal and ecological cycles, the economy becomes increasingly detached from the cyclical foundations on which they depend, a pattern reflected in documented declines in global circularity rates in recent years. The poster uses the Celtic double spiral as a visual and conceptual device for circular bioeconomy learning. One spiral represents material and energy flows through human systems (production, use, and recovery), while the other represents the living cycles that enable and constrain those flows (soil, water, biodiversity, and seasonality). Where these spirals fall out of phase, rifts deepen. Where they are brought back into relation, circularity becomes socially grounded and ecologically credible. Methodologically, the project applies an engaged research approach informed by relational pedagogy, co-producing locally grounded interventions with community partners. These interventions explicitly draw on Irish quarter-day festivals and seasonal traditions (Imbolc, Bealtaine, Lughnasa, Samhain), alongside local cultural resources including place histories, language, symbolism, story and creative practice, as practice infrastructures for circular bioeconomy learning. The guiding question is: what local knowledge and practices encoded in seasonal festivals already express ecological timing and reciprocity, and how can these be translated into contemporary circular bioeconomy habits that repair relationships between communities and their environments? The research is currently in the design and partner-engagement phase. Expected outputs include a co-produced conceptual framework and a practical community learning toolkit.

Presentation Type: Poster with 5 min oral presentation

Establishing multi-actor transition groups to drive improved nutrient management at regional scale in Europe.

Clodagh Carr¹, [ORCID](#), Hongzhen Luo², [ORCID](#), Shurpali Narasinha³, [ORCID](#), Aran Blanco⁴, [ORCID](#), James Gaffey⁵, [ORCID](#), Miguel Ángel Suárez⁶ [ORCID](#)

¹Munster Technological University, Ireland

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⁶Centro Tecnológico de la Energía y del Medio Ambiente

Abstract:

Nitrogen (N) and phosphorous (P) are essential nutrients for food production, however, the accumulation of N and P in air, soil, and water leads to environmental damage and biodiversity loss. The NPower project aims to demonstrate technologies and best practices to recover these nutrients, while creating sector-focused multi-actor structures to ensure long-term engagement of key actors towards effective nutrient management. The NPower Regional Clusters (RCs) and their respective Multi-Actor Transition Groups (MATs) serve as the core participatory backbone of the project. Within this framework, the MATs are designed as collaborative spaces that facilitate interactive dialogue through the co-design of solutions across five N/P-emitting sectors. Ecosystem mapping, targeted stakeholder mobilisation, and sector-specific workshops were conducted within each of four regions to consolidate the NPower RCs and MATs in parallel with the development of technical and management solutions for N/P recovery. The four NPower RCs have been defined as Murcia (Spain), Flanders (Belgium), Finland, and Ireland. Within each RC, five MATs were established to cover sectors related to 1) Agriculture, 2) Other Primary Sectors, 3) Water and Waste, 4) Energy and Transport, and 5) Industry. The MATs were launched through a series of co-creation workshops bringing together practitioners, researchers, policy makers, and civil society representatives. In 2025, the first year of NPower, a total of 115 stakeholders were formally integrated into the RCs through the MAT group activities with over 290 participants at the launch events. Furthermore, key economic activities and nutrient-related priorities were mapped by stakeholders in each region. In conclusion, the NPower Irish Cluster together with Regional Clusters in Spain, Belgium, and Finland are now operational as knowledge hubs to evaluate the applicability and transferability of nutrient recovery solutions for each region. Good nutrient management is key to sustainable food production, strengthening food security while protecting natural ecosystems.

Presentation Type: Oral

Environmental Life Cycle Assessment of Irish Wool

Rohankumar Solanki^{1,2}, Jerry D. Murphy, ^{1,2}, Tim W. J. Keady³, Archishman Bose^{1,2}

¹Sustainability Institute, University College Cork

²School of Engineering and Architecture, University College Cork

³Teagasc, Animal & Grassland Research Centre, 6. Sustainability Institute, University College Cork

Abstract:

As Ireland transitions towards a climate-neutral and biodiversity-rich economy, there is more pressure on agriculture and material-intensive sectors to reduce their respective environmental burdens. The agri-food sector in Ireland contributes approximately 38.5% of national greenhouse gas emissions. Almost 92% (~ 4.1 Mha) of agricultural land in Ireland is dominated by permanent grassland and rough grazing, supporting extensive pasture-based livestock production. Sheep are the second most numerous livestock category after cattle, primarily reared for meat production with an estimated 3.6 million sheep, producing approximately 7 million kg of wool annually. Irish wool typically comprises strong fibres (greater than 30 µm diameter), limiting its suitability for high-value apparel markets and resulting in low farm-gate returns. Nonetheless, it is perfectly placed to meet the demands for natural fibres in textile, manufacturing and packaging sectors. However, this fibre stream remains economically marginal within meat-dominated production structures, as untreated wool from healthy animals is classified as a Category 3 (low-risk) animal by-product under EU legislation, requiring regulated handling and approved processing routes. This has led to a significant research gap in evaluating the environmental performance and hence the sustainability of Irish-grown wool. Existing life-cycle assessment studies of Irish sheep farming focus on sheep meat production. The objective of this study is to develop a cradle-to-grave life cycle assessment of Irish wool for application in textiles, packaging, and construction, and to generate Irish-specific data to inform nationally grounded environmental benchmarks. These evaluations would be critical to estimate the handprint (benefits over conventional alternatives) of Irish wool. The results from this study will help reposition wool from a residual by-product to a climate-relevant bioresource within Ireland's circular bioeconomy.

Presentation Type: Oral

Integrated Molecular and Optical Assessment of Aged Paints: ATR-FTIR Characterisation and Transferable Colour Prediction Models for Reuse Applications

Musfir Ameen¹, Asif Mahmud¹, [ORCID](#), Aoife Morrin¹, [ORCID](#)

¹Dublin City University

Abstract:

The reuse of surplus household paints represents a practical pathway toward waste reduction and resource efficiency within circular economy strategies. However, variability arising from storage history, formulation differences, and brand-dependent composition often affects both material integrity and colour predictability, limiting reliable reuse. This work presents an integrated framework combining molecular characterisation and predictive colour modelling to address these challenges in heterogeneous paint systems. Attenuated total reflectance Fourier-transform infrared (ATR-FTIR) spectroscopy is employed to compare relatively fresh paints (unused surplus, manufacturer returns, and recently opened products) with stored or non-standard samples. Baseline spectral fingerprints are established and evaluated to identify molecular-level variations within the polymeric binder matrix, with emphasis on functional group changes associated with oxidative processes, structural modification, and formulation variability. The potential for rapid, non-destructive screening using portable FTIR systems at civic amenity and collection sites is also considered. In parallel, colour prediction in mixed paints from multiple commercial brands is investigated using a physics-informed modelling strategy. Differences in pigment dispersion, binder composition, and optical scattering introduce non-linear mixing behaviour that is insufficiently captured by conventional perceptual colour spaces. Colour information is therefore represented using physically derived optical features, and a neural network model is developed to predict mixture outcomes based on paint identity and mixing ratio. Model performance is evaluated against approaches relying solely on fresh, standardised paints and perceptual colour coordinates to assess transferability across non-standard systems. By linking molecular insights with optical modelling, this study advances a transferable framework for evaluating paint integrity and predicting realistic colour outcomes in reuse scenarios. The approach aims to improve confidence in redistributed paints and to support scalable, evidence-based paint reuse practices.

Presentation Type: Poster with 5 min oral presentation

Enhancing Humic Substance Recovery from Wastewater Digestates through Hydrothermal Processing

Shon George Shiju^{1,2,3}, [ORCID](#), Krishnakumar Chullipalliyalil⁴, Patrick Quille^{5,6}, Niall O'Leary O'Leary⁷, Gaurav Rajauria^{1,2,3}

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⁴Centre for Advanced Photonics and Process Analysis, Munster Technological University, Cork, Ireland

⁵Plant Biostimulant Group, Centre for Applied Bioscience Research, Tralee, Ireland

⁶Department of Biological and Pharmaceutical Science, Munster Technological University, Tralee, Ireland

⁷School of Microbiology, University College Cork, Cork, Ireland

Abstract:

Expanding anaerobic digestion (AD) capacity inherently increases digestate generation, creating persistent challenges for its end-of-life management. However, accelerated microbial humification during AD process positions digestate as a promising secondary feedstock for the recovery of humic substances (HS), a value-added agricultural product with biostimulant and soil-remediating properties. This study evaluates a rapid hydrothermal assisted alkaline extraction (HAE) approach for HS recovery from two anaerobic digestate (dairy-derived and wastewater-derived) matrices. Extraction was conducted at 121 °C for 30–120 min to identify thermokinetic optimal for solubilisation and depolymerisation of humified organic matter, in contrast to lengthy overnight conventional extraction (CE) protocols (~16 h). HS recoveries reached $202.17 \pm 1.67 \text{ mg g}^{-1} \text{ db}$ (HA) and $567.49 \pm 0.11 \text{ mg g}^{-1} \text{ db}$ (FA) for wastewater digestate, and $89.45 \pm 0.01 \text{ mg g}^{-1} \text{ db}$ (HA) and $782.27 \pm 0.51 \text{ mg g}^{-1} \text{ db}$ (FA) for dairy digestate. Extraction efficiencies ranged from 75–81% and 85–87% for wastewater and dairy sludge digestates, respectively. Residual solids were subsequently subjected to thermal conversion to produce biochar, supporting an integrated zero-waste valorisation pathway. Extracted HS were characterised with higher nitrogen and sulphur content when compared with reference standard. Compositional differences between dairy- and wastewater-derived extracts, reflects on the feedstock-dependent transformation pathways during AD, however these, digestate-derived HS exhibited functional similarity to reference standards, plausibly supporting their functional equivalence for agronomic application. These findings demonstrate that HAE provides an efficient, rapid, and scalable strategy to valorise digestates into humic-rich products suitable for use as biostimulants and soil conditioners. The approach supports circular nutrient management and advances a zero-waste framework for biowaste treatment while contributing to sustainable crop production systems.

Presentation Type: Oral

Development of a Structured Techno-Economic Assessment Framework for Humic Substance Recovery from Anaerobic Digestate

Avinash chauhan¹, [ORCID](#), Anushree Priyadarshini¹

¹School of Business, Maynooth University

Abstract:

The valorisation of anaerobic digestate into high-value humic substances offers a promising pathway to enhance circular bioeconomy strategies while improving the economic feasibility of waste management systems. This study develops a structured techno-economic assessment (TEA) framework for the extraction of humic acids (HA) and fulvic acids (FA) from wastewater treatment plant and dairy digestates using two alternative process routes: conventional alkaline extraction (CE) and ultrasound-assisted extraction (UAE). A detailed process-based inventory was established by aligning techno-economic data collection with an existing life cycle assessment (LCA) workflow, enabling consistent tracking of material flows, energy consumption, and equipment requirements across drying, alkaline extraction, centrifugation, acid precipitation, and product separation stages. Mass and energy balances were formulated on a per-batch basis, while capital and operating expenditures were estimated using equipment specifications, chemical consumption rates, and utility demands derived from experimental process data. The TEA framework evaluates the economic implications of process intensification through ultrasound, considering impacts on processing time, energy use, and product recovery. Preliminary results highlight key cost drivers associated with drying energy, chemical usage, and centrifugation operations, while demonstrating how integrated data structures can streamline combined TEA–LCA analyses for emerging bio-based processes. The proposed methodology provides a scalable and transparent approach for assessing the economic viability of humic substance recovery from digestate and supports decision-making for sustainable resource recovery technologies.

Presentation Type: Oral

Biodegradable foam synthesized from lignin rich brewers spent grain waste with potential use as a sustainable alternative for packaging applications

Soumya Padinjarakavil¹, [ORCID](#), Jiao Zhang¹, [ORCID](#), Adriana Cunha Neves¹, [ORCID](#)

¹South East Technological University

Abstract:

Biodegradable foams derived from agro-industrial residues offer a promising route to replace persistent petrochemical based packaging materials while supporting circular bioeconomy targets. This study reports the synthesis and comprehensive characterization of gelatin–starch biofoams reinforced with raw brewers’ spent grain (BSG1) from the brewing industry and lignin-enriched BSG2 and BSG3 residues, obtained post-fermentation after CaO-assisted phosphoric and sulfuric acid hydrolysis for 3-hydroxypropionic acid production. Compositional and FTIR analyses confirmed a substantial lignin enrichment in acid-processed BSG fractions (BSG2, BSG3) relative to raw BSG (BSG1), indicating selective polysaccharide removal and generation of lignocellulosic residues suitable for polymer reinforcement. Foams prepared with BSG2 and BSG3 exhibited more uniform open-cell microstructures, smoother surfaces, and darker reddish-brown coloration than BSG1, consistent with enhanced lignin content. Density, moisture content, and water absorption measurements showed that acid-treated BSG foams were less dense and significantly less hydrophilic than BSG1, while remaining more water-absorptive than commercial expanded polystyrene foams, highlighting scope for formulation tuning towards specific packaging. All BSG-based foams displayed markedly higher solubility in river and seawater and achieved near-complete degradation in soil within 7–8 weeks, which is contrary to commercial foams that showed negligible mass loss over the same period. Under uniaxial cyclic compression to 80% strain, lignin-enriched foams (BSG2, BSG3) reached compressive strengths of 0.49–0.50 MPa, approximately double that of raw BSG foam and exceeding commercial styrofoam, while maintaining lower permanent deformation and superior thickness recovery, evidencing a favourable balance of strength, stiffness, and structural integrity. Together, these results demonstrate that lignin-rich residues from BSG valorisation can be engineered into mechanically robust, rapidly biodegradable biofoams, positioning BSG2 and BSG3 based formulations as promising candidates for sustainable protective packaging and bulk transport cushioning applications.

Presentation Type: Poster with 5 min oral presentation

Impacts of Mechanical Pre-Treatment Strategies on Green Juice Yield and Protein Precipitation in a Pilot-Scale Grass Biorefinery

Jagdeep Kumar Nayak¹, Megan O'Brien^{1,2}, Joanna Przyborska¹, Adam Mulcahy¹, James Gaffey,^{1,2}

¹Circular Bioeconomy Research Group, Shannon Applied Biotechnology Centre, Munster Technological University,

²BiOrbic, University College Dublin

Abstract:

Green biorefineries offer a sustainable pathway for valorising fresh grass into high-value products such as leaf protein concentrate (LPC), fibre fractions, and nutrient-rich brown juice streams. However, translating laboratory findings into industrially viable systems requires optimisation under pilot-scale conditions where material handling, throughput stability, and equipment performance directly influence process feasibility. This study presents a pilot-scale optimisation of mechanical fractionation and thermal protein precipitation to generate scale-up relevant data for first ever demonstration-scale deployment in Ireland. A ryegrass-clover mixture was processed using four mechanical configurations: (i) shredder + single screw press, (ii) single screw press alone, (iii) twin screw press, and (iv) shredder + twin screw press. The configurations were evaluated based on green juice yield, dry-matter distribution, mass-balance closure, throughput consistency, and operational stability during continuous pilot-scale operation. Mechanical pre-treatment significantly enhanced cell disruption and juice recovery, with intensified compression and shear improving intracellular protein release and extraction efficiency. Thermal precipitation experiments conducted across a controlled temperature range identified optimal coagulation conditions for maximising protein recovery and LPC yield. Temperature strongly influenced protein denaturation kinetics, floc formation behaviour, separation efficiency, and supernatant clarity, thereby affecting downstream processing performance. The integrated optimisation of mechanical extraction and controlled thermal treatment improved overall process robustness and protein recovery efficiency at pilot scale. The generated operational data provide critical design parameters for equipment sizing, energy assessment, and process integration, supporting techno-economic evaluation and scale-up towards demonstration-scale green biorefinery systems.

Presentation Type: Poster with 5 min oral presentation

Green biorefinery approach for sustainable use of grassland into biochar

Viruja Ummat^{1,2}, James Gaffey^{1,2}, Sergio Sanchez³, Karina Pierce⁴, Kevin McDonnell⁴, Pdraig Walsh⁵

¹Munster Technological University

²BiOrbic Bioeconomy Research Centre

³Envirohemp, Navarra, Spain

⁴University College Dublin

⁵Carbery Food Ingredients Limited

Abstract:

Large volumes of agricultural and agri-food residues remain underutilised despite their strong potential within the circular bioeconomy. The Horizon Europe EMBEDDED project, involving partners from Ireland, Spain, the Czech Republic, and Portugal, aims to develop practical and scalable technologies that convert biomass into high-value sustainable products. In Ireland, Munster Technological University, in collaboration with University College Dublin and Carbery, is demonstrating a pilot-scale green biorefinery processing fresh grass and silage into multiple product streams. While leaf protein concentrate offers opportunities for sustainable feed, the brown juice fraction provides potential for nutrient recovery as well as the extraction of high-value carbohydrates and polyphenolic compounds. Particular emphasis is placed on the valorisation of the grass press cake fraction. Grass press cake, often regarded as a low-value byproduct, is upgraded through pyrolysis to produce biochar. Biochar is a carbon-rich material formed through thermal conversion under limited oxygen conditions. Application of biochar to soil enhances soil structure, improves water retention, increases nutrient-use efficiency, and immobilises contaminants. It also functions as a long-term carbon sink, due to presence of stable carbon structures, capable of persisting in soils for very long periods. Biochar production from grass press cake remains relatively underexplored. Utilizing the fibre residue generated during protein extraction for biochar production represents a promising opportunity to enhance both the environmental and economic performance of green biorefineries. Through optimised thermal treatment by Envirohemp in Spain, the press cake is transformed into a stable, multifunctional biochar currently being evaluated as a soil amendment and a potential livestock feed additive, supporting circular nutrient flows within grass-based farming systems. By integrating green biorefinery processing with biochar production, this cascading valorisation pathway enhances overall resource efficiency and supports agricultural sustainability.

Presentation Type: Poster

Developing an Integrated Life Cycle Sustainability Framework for Circular Bovine and Ovine Co-Product Valorisation

Sameen Fatima¹, Tamiris Da Costa¹, Fionnuala Murphy¹

¹University College Dublin

Substantial volumes of bovine and ovine co-products generated by the Irish red meat sector remain low-value streams that are costly to manage. These materials represent a valuable opportunity for circular bioeconomy valorisation. Emerging biorefinery technologies can convert non-meat fractions and wastewater into high-value bio-based products; however, their environmental, economic, and social implications remain insufficiently characterised from a life cycle perspective. This study systematically reviews existing life cycle assessments (LCA) on livestock co-product valorisation to characterise current sustainability evaluation approaches, identify methodological gaps, and develop an integrated life cycle sustainability assessment (LCSA) framework. A literature search across major databases (2010–2025) retrieved 1,206 records. After removing duplicates (308) and screening, 28 studies met the inclusion criteria. Results reveal a strong environmental bias: 71% applied environmental LCA, 17% included life cycle costing (LCC), and only 7% conducted complete LCSA, while explicit social assessments were scarce (3%). Considerable variation exists in functional units, system boundaries, and allocation methods, often lacking transparent justification. Environmental assessment remains dominated by global warming potential, fostering carbon tunnel vision and overlooking broader economic and social dimensions. A unified LCSA framework is being developed under the CirCoVal project. It recommends standardised goal and scope definitions, key environmental indicators, harmonised LCC templates, and hierarchical social indicators aligned with technology readiness levels. This integrated approach supports early scoping and continuous refinement of sustainability evaluations, enabling evidence-based design, scaling, and policy development toward a circular red meat bioeconomy.

Presentation Type: Poster

Session Theme: AI, Machine Learning and Modelling in Environmental Science.

Analytical Insights into Cyanobacterial Bloom: Lough Neagh Analysis for Water

Management Case study

Frederick Akpomie¹, [ORCID](#), Svetlana Tretsiakova-McNally¹, [ORCID](#), Brian Solan¹, [ORCID](#), Pilar Fernandez-Ibanez¹, [ORCID](#)

¹Ulster University, United Kingdom

Abstract:

In recent years, Lough Neagh has endured cyclic, lake-wide cyanobacterial bloom despite decades of nutrient-reduction efforts. The Lough Neagh Report and Action Plan (2024) has identified phosphorus control at its core, yet implementation is constrained by a lack of high-resolution, system-specific understanding of the drivers of blooms in this shallow, polymictic waterbody. Addressing that gap, this study aims to contribute in transforming routine monitoring data into actionable, predictive insights. From November 2024 to September 2025, surface waters were sampled across 11 representative sites of the Lough. Physicochemical indicators including pH, dissolved oxygen, turbidity, colour, nutrients, and temperature, as well as chlorophyll-a (Chl-a) as a proxy for algal biomass, and meteorological data were analysed using non-parametric statistics, multivariate ordination, linear modelling, and Random Forest regression. Unanimously, all approaches identified phosphate, turbidity, and colour as the strongest predictors of Chl-a, highlighting persistent internal phosphorus loading and sediment resuspension as major controls in this legacy-nutrient system. Spatial patterns revealed highly heterogeneous bloom behaviour: hot-spot sites reached mean Chl-a concentrations of 32–59 µg/L, while cold-spot locations remained closer to the WHO's vigilance thresholds (12 µg/L). Pronounced seasonal patterns were observed, with bloom intensification under warmer temperatures, lower wind speeds, and reduced precipitation. By providing the first comprehensive, machine learning supported assessment of bloom drivers in Lough Neagh, this study offers an evidence base that supports adaptive water-resource management and aligns with broader sustainability ambitions. The results further provide transferable insights for other shallow temperate lakes facing similar legacy-nutrient pressures and climate-amplified water-quality risks.

Presentation Type: Oral

Detecting CO₂ effects on terrestrial ecosystem carbon storage from long term experiments and their implication for the global carbon cycle

Freddie Fallon¹, Silvia Caldararu¹

¹Trinity College

Abstract:

Detecting CO₂ effects on terrestrial ecosystem carbon storage from long term experiments and their implication for the global carbon cycle Freddie Fallon, Silvia Caldararu Atmospheric CO₂ enrichment is commonly understood to be a driving factor in anthropogenic climate change through its role in increased carbon uptake by ecosystems and the implied increase in the terrestrial carbon sink. Studies have shown that increased CO₂ availability increases plant biomass, but this increase is limited by factors such as nutrient availability and incident irradiance. However, the extent to which atmospheric carbon enrichment affects global carbon stocks through changes in plant biomass at the ecosystem level, and how this could impact the global carbon cycle, remains uncertain. Traditionally, these estimates come from manipulative experiments (FACE) and process-based vegetation models. Here, we use measurements from long-term experiments (LTER) to explore how the CO₂ fertilisation effect has played out in real-world conditions, taking advantage of the large increase in atmospheric CO₂ concentrations that has already taken place. We show that the strength of correlation between atmospheric CO₂ and aboveground plant biomass in ecosystems increase is dependent on the ecosystem type and global ecoregion, as well as average baseline climate conditions. While current reporting shows that up to 24% of terrestrial carbon stocks have been depleted in the Anthropocene, our results show that in intact ecosystems and potentially in restored ones as well, carbon sequestration can continue to increase with elevated CO₂, although the effect differs markedly among ecosystems.

Presentation Type: Poster

Student Perspective on Artificial Intelligence in Environmental Studies across Various Disciplines Bridging Sustainable Monitoring

Monika Yadav¹, [ORCID](#), Shubham Sharma², [ORCID](#), Abhishek Kaushik³ [ORCID](#),

¹Rama University, Uttar Pradesh, India

²Technological University Dublin

³Dundalk Institute of Technology

Abstract:

Climate change and pollution are growing issues in today's world. Artificial Intelligence (AI) offers an impactful solution to these challenges through advanced data analysis and predictive modelling. Integrating AI within Environmental Science programs is a promising approach to enhancing environmental monitoring and remediation. To investigate this potential, a comprehensive study is currently underway, with data collection conducted in India in accordance with the regulations of the lead author's institution. The survey-based assessment utilizes multiple-choice questions, yes/no responses, awareness evaluations, and Likert-scale ratings (1–5) to identify barriers and opportunities. The scope encompasses concepts such as predictive modelling for pollution tracking, biodiversity monitoring, Biodiversity laws, smart waste systems, and pharmaceutical waste detection. Furthermore, it evaluates the cost-effectiveness, scalability, and productivity of AI at a human scale, as well as its alignment with public health perspectives. The primary aim of this study is to assess AI literacy among students from various disciplines in India who are enrolled in Bachelor's and master's programs and study Environmental Science as a module. We examined their familiarity with AI applications, evaluated their perspectives on how AI can assist in environmental assessment, and gathered practical feedback on its implementation for sustainability. This research serves as a foundation for curriculum reform, suggesting the integration of AI at the foundational levels of environmental education to promote AI driven resource management and innovative applications. Ethical approval was not required for this study, as it was a low-risk survey that did not collect personal identifiers.

Presentation Type: Oral

Session Theme: Advancements in Renewable Energy and Sustainable Energy Technology.

Biomass estimation multi-sectoral computational framework for Ireland

Mohammad Sameti¹, [ORCID](#), Carmen Giron Dominguez¹, Krishna Panduru¹, James Gaffey¹

¹Munster Technological University

Abstract:

As Ireland targets carbon neutrality by 2050, the reliability of biomass supply chains becomes a critical factor in national energy security. This study introduces the Enhanced Hybrid Biomass Forecasting Model, a multi-sectoral computational framework designed to transition biomass estimation from deterministic "best-guesses" to probabilistic distributions. Utilizing a primary dataset of 24 distinct feedstocks across the Agriculture, Forestry, and Marine sectors, a model is proposed to simulate biomass availability through 2030, 2040, and 2050. Systemic risks are taken into account to maintain intra-sector correlations that reflect realistic dependencies among related feedstocks. Results are presented across three policy-driven scenarios: High Policy, Baseline, and Low Policy, quantifying the "bankable" supply floor and the optimistic potential. The findings demonstrate that while individual county-level yields exhibit high volatility, national-level aggregation provides a stabilized portfolio effect, offering a more resilient roadmap for bioenergy infrastructure investment. This framework provides policy-makers with the statistical confidence needed to size future anaerobic digestion and thermal conversion capacities amid environmental and economic uncertainty.

Presentation Type: Oral

Modelling of an Alkaline Water Electrolyser in Aspen Plus

Mohadeseh Naderi¹, [ORCID](#) Wayne Doherty¹, Anthony Reynolds²

¹Centre for Renewables and Energy (CREDIT), Dundalk Institute of Technology

²Technological University of Dublin

Abstract:

Hydrogen production via water electrolysis is increasingly recognised as a key pathway for storing surplus renewable electricity and supporting low-carbon energy systems. Among available technologies, alkaline water electrolysers remain the most mature and widely deployed option for large-scale power-to-gas (PtG) applications due to their robustness, long operational lifetime, and comparatively low cost. Despite their industrial relevance, modelling of alkaline electrolysis suitable for integration into system simulations remains limited. In this study, a steady-state Aspen Plus model of an alkaline water electrolyser was developed for PtG applications. Since Aspen Plus does not provide a built-in electrochemical electrolyser module, the electrolyser stack was modelled using standard unit operations based on a validated reference model. The model captures mass and energy balances, hydrogen and oxygen generation rates, and electrical power consumption under pressurised operating conditions. Validation against reference data demonstrates close agreement, confirming the robustness of the developed model. High-purity hydrogen and oxygen products are obtained through idealised gas–liquid separation units. Sensitivity analyses indicate that hydrogen and oxygen production rates increase linearly with stack power, consistent with Faraday’s law, while operating temperature primarily affects the net heat duty required to maintain stack conditions. The overall electrolyser efficiency was calculated as 62.33%, within the typical range reported for alkaline systems. The validated Aspen Plus electrolyser model provides a basis for future integration with downstream processes such as methanation and biomass gasification in broader PtG applications.

Presentation Type: Oral

Analysis of Solar PV Usage and Subsequent Optimisation to Maximise the Benefits for Residential Properties in Ireland

Daniel Dransfield¹, [ORCID](#), Niamh Power¹

¹Munster Technological University, Cork, Ireland

Abstract:

Behind-the-meter (BtM) energy optimisation is becoming increasingly important as the transition to a renewable energy future continues at pace. The changing energy landscape can be difficult for people to understand and interact with. At the same time the number of homes with solar PV in Ireland has more than doubled in two years. These early adopters can help to guide optimisation strategies and policy into the future. As Ireland's generation mix continues to evolve and the move to dynamic Time-of-Use (ToU) tariffs on the horizon, it is more important than ever that residential electricity users are informed on how to optimise their usage BtM, whether for a cost-saving or carbon-minimising objective; the two don't always align. The requirements for optimising BtM are smart metering (Ireland has had a very successful roll-out to mostly satisfy this essential requirement), price or carbon signals such as dynamic and ToU tariffs or grid carbon intensity notifications, Control and feedback systems such as In-Home-Displays (IHDs), Home Energy Management Systems (HEMs) or mobile applications with smart appliances and finally flexible loads and technologies such as EVs, heat pumps, batteries or smart/flexible white goods. The optimisation is also constrained by the following factors, technology and energy literacy, motivation and willingness of the home occupier and occupancy and convenience factors. The opportunity to optimise this cohort is significant and could provide flexibility in the GWh scale for the Irish system. Detailed in-person surveys and energy data collection with 59 Irish early adopters of PV have been boosted by a wider survey of the electricity usage of 404 households. While the initial homes were energy-aware and already optimising their use to achieve a carbon or cost objective. There is huge potential to expand this to homes all across the country.

Presentation Type: Oral

Economic Assessment of Hydrodynamic Performance Improvements in Floating Offshore Wind Turbines

Naghmeh Akbari Zadeh¹, Peter Ryan¹, Fergal O'Rourke¹

¹Centre for Renewables and Energy, School of Engineering, Dundalk Institute of Technology

Abstract:

Ireland is one of many European countries planning to achieve net-zero emissions by 2050 under the Climate Action Plan 2021 (CAP21). Due to its location, Ireland benefits from strong, consistent wind resources, providing favourable conditions for wind turbine deployment. Accordingly, floating offshore wind turbines (FOWTs) play an important role in this program. However, these complex structures are subjected to significant environmental loads in deep waters, including wave, wind and current forces. These loads have a substantial effect on wind turbine performance. Improving FOWT efficiency and power generation requires research efforts in both industry and academia. One of the methods to improve FOWTs performance is controlling the platform motions in six degrees of freedom, particularly surge and pitch motions. Due to the direct effect of these two motions on rotor displacement, monitoring them can improve aerodynamic performance. In this paper, the NREL 5 MW spar wind turbine with different mooring arrangements is analysed under wave-wind loading. This study is carried out at a potential site located on the west coast of Ireland. A novel fully coupled tool, F2A, is utilised to perform aero-hydro-servo-elastic simulations. The primary aim is to investigate the effect of motion amplitudes on aerodynamic performance under different mooring configurations. The Annual Energy Output (AEO) and also the Levelised Cost of Energy (LCOE) are calculated for the models with different mooring systems. The initial results indicate reduced surge and pitch motion, and a significant reduction in rotor thrust force of up to 40% relative to the baseline configuration. The reduction in rotor thrust results in lower structural loading, reduced fatigue damage, and lower operation and maintenance costs, directly improving lifecycle economics. The lower LCOE offers greater cost efficiency by improving the balance between aerodynamic performance and operational and maintenance costs.

Presentation Type: Poster

Comprehensive modelling methodology for a Wells turbine through computational fluid dynamics

Zak Hawthorne¹, Peter Ryan¹, Fergal O'Rourke¹

¹Centre for Renewables and Energy (CREDIT), Dundalk Institute of Technology

Abstract:

The oscillating water column (OWC) is a leading candidate in ocean wave energy and the most heavily studied device to date. The use of an air turbine reduces the typical issues associated with seawater-induced corrosion found in most competing devices. Despite this, turbine selection remains a technical challenge. Hence, further analysis of the potential turbine candidates is of exceptional value in selecting a unified turbine design that will help the OWC reach economic viability. This goal is especially significant for the Republic of Ireland, which has some of the highest ocean wave energy potential in the world. This study presents a validated, reproducible computational fluid dynamics (CFD) methodology, covering mesh generation, turbulence modelling, simulation strategy, and post-processing procedures for a Wells turbine designed for operation within an OWC wave energy converter. Simulations are conducted under three-dimensional, turbulent, steady-state, and transient flow conditions. Both a traditional turbomachinery approach using multiple reference frames and a single-domain approach commonly used in existing literature are considered. Key metrics are derived using two commonly used evaluation approaches and compared for parameters such as turbine efficiency, torque coefficient, and pressure coefficient. This methodology is applied to a Wells turbine, and the predicted peak torque is found to be within 5% of existing experimental data, confirming the validity of the overall methodology for the study of further, more complex turbine geometries.

Presentation Type: Oral

Co-Digestion of Grass Silage and Cattle Slurry for Grid Decarbonisation and Phosphorus Sequestration

Mahamad Yousif¹, [ORCID](#), Beatrice Smyth¹, [ORCID](#), Ife Bolaji¹, [ORCID](#), Christopher Johnston²

¹Queen's University Belfast, United Kingdom

²Agri-food and Biosciences Institute for Northern Ireland

Abstract:

Decarbonising electricity while addressing agricultural nutrient surpluses is a critical challenge in livestock-intensive regions. This study evaluates an integrated system designed to deliver net-negative-emissions electricity, along with phosphorus sequestration and nutrient recovery. The environmental performance of an anaerobic digestion system co-digesting grass silage and the solid fraction of cattle slurry was evaluated using life-cycle assessment in accordance with ISO 14040 and ISO 14044. The system integrates digestate management using a decanter centrifuge separation, belt drying with ammonia capture, and pyrolysis, producing biochar for the substitution of carbon black in cement tiles, as well as bio-oil, syngas, and electricity via a ~500 kW_e combined heat and power unit. The functional unit was defined as 1 kW_e of electricity exported to the grid. The system was designed to operate for 8,000 hours annually using locally sourced feedstocks. The results indicate that the system can export 3.1 GW_e of electricity per year and achieves net greenhouse gas emissions of -0.2537 kg CO₂e per kW_e, a reduction of 0.4307 kg CO₂e per kW_e compared to the UK grid electricity. Substantial environmental benefits arise from biochar substitution for carbon black, the displacement of synthetic fertilisers, and the utilisation of surplus heat to offset natural gas. Total ammonia emissions were estimated at a low level of 2.3 g per kW_e, owing to the advanced digestate management. The system also adds value by enabling long-term phosphorus sequestration of 7.8 g phosphorus per kW_e in biochar. Cattle slurry separation reduced the greenhouse gas and ammonia emissions from storage and land application by 11% and 17%, respectively. The results demonstrate that integrated anaerobic digestion coupled with advanced digestate management can produce net-negative greenhouse gas electricity while enhancing nutrient circularity and reducing agricultural emissions. This system, therefore, represents a viable pathway for sustainable energy production in livestock-intensive regions.

Presentation Type: Oral

Evaluation of ternary iron nickel boride electrocatalysts in sustainable electrochemical energy production

Conor Cassidy¹, [ORCID](#), Thamaraiselvi Kanagaraj², Raj Karthik¹, [ORCID](#), Aoife Newman¹, [ORCID](#), Oliwier Dulawa¹, [ORCID](#), Daniele Alves¹, Jae-Jin Shim², [ORCID](#), Carmel Breslin¹, [ORCID](#), Eithne Dempsey¹, [ORCID](#),

¹Maynooth University,

²Yeungnam University, Gyeongsan, Korea, Republic of

Abstract:

The development of cost-effective and scalable electrocatalysts for green hydrogen production remains a challenge in sustainable energy technologies. In this work, earth abundant ternary iron nickel boride electrocatalysts were synthesised using a low temperature, wet chemical, single-step reduction method with tunable Fe:Ni composition. Structural and surface analysis was conducted using SEM, TEM, XRD and XPS, confirming the formation of a dual phase composite consisting of amorphous nickel boride integrated with akageneite (β -FeOOH), producing a porous morphology rich in accessible catalytic active sites. Electrochemical evaluation in alkaline media demonstrated that the optimised β -FeOOH-NiB catalyst supported on carbon cloth exhibited excellent hydrogen evolution reaction (HER) activity requiring an overpotential of -80.3 mV @ $j = 10 \text{ mA cm}^{-2}$. After 60 h of operation, the catalyst maintained stable performance, delivering -64.8 mV vs RHE @ 10 mA cm^{-2} , remaining competitive with the Pt benchmark. The incorporation of iron significantly improved reaction kinetics and assisted lowered charge transfer resistance relative to monometallic nickel boride. To reduce overall electrolysis energy demands, the catalyst was also evaluated for anodic biomass electrooxidation utilising glycerol. This lowered the overpotential required for Oxygen evolution reaction (OER) from 371 mV vs RHE @ $j = 10 \text{ mA cm}^{-2}$ to 290 mV vs RHE @ 10 mA cm^{-2} . Biomass introduction not only lowers the overpotential required for OER to occur but also simultaneously reacts resulting in the formation of value-added chemical products such as formic acid (formate). NMR analysis of the resulting solution confirmed the selective glycerol oxidation to formate species, evidencing effective catalytic activity towards biomass valorisation. The β -FeOOH-NiB composite represents a promising bifunctional electrocatalyst capable of coupling hydrogen production with renewable feedstocks upgrading, offering a scalable pathway towards energy-efficient water electrolysis using non-precious metals.

Presentation Type: Poster with 5 min oral presentation

Session Theme: Environmental Monitoring and Remediation

Tracing legacy pollutants in the Irish marine environment using passive sampling techniques

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²Marine Institute, Galway, Ireland

³RECETOX, Faculty of Science, Masaryk University, Brno, Czech Republic

⁴Institute for Molecular Biology and Biotechnology (IMBB), Foundation for Research and Technology Hellas (FORTH), Heraklion, Greece

Abstract:

Passive and dynamic sampling devices are transforming the monitoring strategies of legacy pollutants and contaminants of emerging concern in marine systems, offering a powerful alternative to traditional grab-sampling approaches. By providing time-integrated measurements of the bioavailable fraction of contaminants, these tools are particularly valuable in dynamic marine environments, where concentrations are often low and influenced by variable inputs. In this study, silicone rubber sheets were deployed using two passive sampling configurations: mounted on frames in nearshore estuarine and transitional waters and incorporated into dynamic passive sampler (DPS) devices during offshore ship surveys. Samplers were applied to characterise the occurrence of legacy pollutants, including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides (OCPs), across the Irish marine environment. Preliminary offshore results revealed concentration ranging from 0.5 – 12000 pg·L⁻¹ for PAHs, 0.05 – 46 pg·L⁻¹ for OCPs, and from 0.05 – 1.7 pg·L⁻¹ for PCBs. These findings highlight the ability of passive sampling to capture contaminant signals across a wide concentration range. DPS successfully captured contaminant profiles, demonstrating their sensitivity and robustness in environments where pollutants may be present at trace levels. Overall, this work underscores the complementary strengths of passive sampling and their potential to enhance long-term monitoring strategies for legacy pollutants and emerging contaminants in marine ecosystems.

Presentation Type: Oral

High-Resolution Modelling of Agricultural Ammonia Dispersion at Irish Natura 2000 Sites

Shayan Kabiri¹, Tom Curran¹

¹University College Dublin

Abstract:

Ammonia emissions from agriculture account for most ambient NH₃ pollution in Ireland. Although typical concentrations may be below direct human-health thresholds, research shows that sensitive ecosystems, including bog habitats, can be affected at substantially lower concentrations and shorter exposure periods. Modelling agricultural NH₃ is challenging because emissions vary strongly in time and space, and conventional tools often struggle to represent episodic manure spreading and site-scale processes. To assess potential impacts on Irish Natura 2000 receptors, we developed a high-resolution air-dispersion model tailored to agricultural sources. The framework combines source-specific emission dynamics (housing and fields), meteorological forcing, terrain-aware transport, and stochastic Lagrangian particle principles, implemented with GPU acceleration to enable long simulations at fine spatial and temporal scales. The model produces monthly and sub-daily concentration products designed for ecological screening and hotspot identification. Validation against NEMN monitoring data across four sites (59 monthly periods) shows good overall skill: $R = 0.775$ ($R^2 = 0.600$), $RMSE = 0.687 \mu\text{g m}^{-3}$, $MAE = 0.495 \mu\text{g m}^{-3}$, $FB = 0.229$, $NMSE = 0.329$, and $FAC2 = 0.746$. Site-level performance was strongest at Liffey Head Bog ($R = 0.939$; $FAC2 = 1.00$), while Killycony also performed robustly ($R = 0.508$; $FAC2 = 0.889$). Clara Bog showed a positive bias ($NMB = 61.2\%$), indicating scope for further source or process calibration at high-emission locations. In conclusion, the model is computationally practical and scientifically credible for site-scale ammonia assessment in Ireland, and it provides decision-relevant spatio-temporal detail for evaluating ecosystem exposure and supporting targeted mitigation planning.

Presentation Type: Oral

Agitation rate and hydraulic retention time influence the yield of *Azolla filiculoides* used to remediate an agri-food wastewater

Jingrou Chen^{1,2}, [ORCID](#), Matthew Holland¹, Marcel Jansen^{1,2}, [ORCID](#), Neil Coughlan^{1,2}, [ORCID](#)

¹School of Biological, Earth and Environmental Sciences, University College Cork,

²Sustainable Institute, University College Cork

Abstract:

The agri-food sectors produce substantial quantities of wastewaters annually, making the optimization of water reuse essential. Biological treatments can enhance remediation of agri-food wastewaters in an eco-friendly manner. The water fern, *Azolla filiculoides* (Azolla), is a nitrogen-fixing floating aquatic plant capable of rapid growth, particularly in nutrient-rich wastewater environments. Moreover, Azolla is increasingly utilized as an alternative protein source for livestock due to its high crude-protein content (25-30%). Integration of Azolla into wastewater management systems can support the valorisation of agri-food wastewaters, promoting a closed-loop nutrient cycle where nitrogen and phosphorus are recovered by Azolla and retained within the agri-food chain through incorporation of Azolla biomass into livestock diets. Preliminary investigations have shown that Azolla can be cultivated using effluent from a large industrial meat processor, that had undergone primary treatment. The effects of agitation rates (0, 30, 60, 90, 120 rpm) were evaluated over 7 days under controlled laboratory conditions, while hydraulic retention time (HRT; 3, 5, 7 days) was assessed over a 15-day continuous cultivation period. Relative growth rate (RGR) and chlorophyll fluorescence measurements were measured to assess plant growth performance, along with nutrient removal efficiency for total nitrogen and total phosphorus. The results showed that Azolla covering 20% of the active surface area at 60 rpm achieved the highest RGR ($0.10 \pm 0.006 \text{ day}^{-1}$). The HRT of 3 days appeared to yield better growth compared with HRTs of 5 and 7 days over 15 days. Findings underpin the development of Azolla-based phytoremediation and high-protein biomass production as part of agri-food wastewater management.

Presentation Type: Oral

Leveraging Largescale Digital Data & AI for Understanding Greenspace & Air Pollution Exposure Inequalities in Urban Areas

Marguerite Nyhan¹, [ORCID](#)

¹University College Cork

Abstract:

Rapid urbanisation worldwide has brought major urban sustainability challenges, including the growing number of people exposed to air pollution in cities. There has never been a more urgent time to reduce exposure to air pollution and increase exposure to green spaces to improve public health in urban areas. With the digital revolution and advances in artificial intelligence (AI), new approaches to the study of urban environmental exposures have emerged. These include how air pollution and greenspace can be quantified in high spatial resolution for entire cities using vast digital datasets and AI models, and how exposures of large populations can be dynamically quantified using largescale human mobility datasets. As such, through a number of urban case studies in the US and Europe, the author will present an overview of her research on air pollution and greenspace quantification methodologies using largescale digital datasets, street imagery data, sensors and AI-based computational methods; and further research on evaluating human exposure inequalities using mobile phone and census data. Accordingly, this research aims to inform more equitable and just urban environmental planning decisions and future environmental policies. This interdisciplinary research on smart and sustainable cities supports the implementation of Sustainable Development Goals (SDGs) 11 and 3, which focus on sustainable cities and communities and good health and well-being, respectively. Professor Marguerite Nyhan would like to thank Research Ireland Frontiers for the Future for funding this research.

Presentation Type: Oral

Growth assays as novel biomarkers for environmental pollution using water fleas

Flavia Melati Chiappara, [ORCID](#), Konstantinos Gritzalis, [ORCID](#)

¹Dublin City University

Abstract:

Conventional water quality monitoring methods lack the sensitivity required to detect sublethal pollution effects and provide limited mechanistic insight into contaminant action. New Approach Methodologies (NAMs) are increasingly adopted as complementary tools that provide sensitive, biologically relevant metrics for pollution assessment. In this context, freshwater sentinel species such as daphnids serve as effective bioindicators of contaminant impacts. Phenotypic and physiological endpoints constitute a first screening tier for evaluating sublethal chemical effects, with growth measurements serving as a robust phenotypic indicator of physiological trade-offs and environmental stress. This study investigated the optimisation and miniaturisation of a daphnid growth assay to enhance the standardisation and reproducibility of phenotypic testing. Key methodological components, including experimental setup, imaging, and measurement software, were refined to facilitate the integration of phenotypic assays into routine water quality monitoring. The optimised assay was then applied to assess the toxicity of common freshwater pollutants. Results demonstrated significant pollutant-induced impairments in daphnid development, including decreased size, thus confirming body-size metrics as a sensitive and non-invasive marker of sublethal stress. This elevates miniaturised growth assays as a practical early-warning tool for detecting ecosystem disruption, advancing biologically based water quality assessment.

Presentation Type: Oral

A Soil Chamber Platform for QEPAS Monitoring of Agricultural Greenhouse Gas Emissions Under Controlled Conditions.

Daniela Lopez^{1,2}, Venkata Vamsi Bharadwaj Yallapragada², William Whelan-Curtin²

¹Teagasc, Wexford, Ireland

²Munster Technological University

Abstract:

Greenhouse gas (GHG) emissions from agriculture are a major concern in the context of climate change and challenge the development of more sustainable and smart farming practices. GHGs include CO₂, CH₄, and N₂O linked to fertiliser use and soil management driven by biological activity and chemical reactions within soil nutrient cycles. As part of smart agriculture, real-time multi-gas detection is becoming essential for accurately monitoring greenhouse gas emissions in agricultural systems, where optical spectroscopic techniques are increasingly used for environmental analysis. Among these approaches, Quartz Enhanced Photoacoustic Spectroscopy (QEPAS) has gained particular attention due to its high sensitivity, strong selectivity, rapid response, and ability to detect trace gases at ppb levels through photoacoustic signal amplification, making it well-suited for identifying variations in soil gas emissions under complex conditions. To enable future in situ deployment, preliminary laboratory-scale experiments were conducted. To ensure continuous and reproducible measurements, a custom-built gas sampling system was developed, allowing soil samples to be placed directly inside a sealed chamber where gas accumulation, airflow, and moisture conditions can be carefully regulated. Gas circulation is maintained through inlet and outlet tubing connected to a single adjustable pump, ensuring stable sampling conditions during monitoring cycles. The system was used to evaluate emissions from soils obtained from the Teagasc Johnstown research facility, including untreated soils and soils amended with nutrients and agricultural fertilisers, allowing assessment of how different amendments influence nitrogen- and carbon-based gas production. This controlled approach supports detailed investigation of microbial and physicochemical processes associated with soil management. In addition, the long-term goal of this work is to facilitate deployment of the QEPAS sensor in-situ gas measurements, providing real-time information that can help farmers optimise nutrient management practices and improve environmental and operational outcomes.

Presentation Type: Oral

Ecological linkages between nematode and plant diversity in an Irish built environment: lessons on soil health

Alejandra Vieyra-Ramirez¹, Lisa Moran², Cara Daly³, Zeta Dooly³, Thomais Kakouli-Duarte¹

¹South East Technological University, Carlow, Ireland

²Technological University of the Shannon, Athlone, Ireland

³South East Technological University, Waterford, Ireland

Abstract:

Above- and belowground interactions are fundamental for ecosystem functioning and delivering of services in terrestrial ecosystems. The concept of soil health brings these elements together as it is commonly defined as the ability of the soil to sustain its biodiversity, productivity, and to provide environmental services. The analysis of nematode diversity is a common approach when assessing soil health in agricultural and natural ecosystems. However, the study of soil health using nematode and plant diversity has not been deeply or extensively investigated in built environments, like public gardens. In this study, above- and belowground ecological links are being explored in an Irish garden using environmental nematology and plant ecology methods. Seven sampling plots with different plant species distributions were established in the study site. Nematode-based indices suggested variability in the soil food web structure across the garden, and plant diversity was also different between plots.

The results contribute to the knowledge on soil health and its importance for built environments

Presentation Type: Oral

Hidden Exposure: An Inventory of Mercury Identifying Gaps in Irish Pollutant Tracking

Deirdre Lynch¹, [ORCID](#), Yvonne Ryan-Fogarty¹, [ORCID](#)

University of Limerick

Abstract:

The World Health Organisation classifies mercury within the top ten chemicals of major public health concern. Mercury and its compounds when released to the environment become highly toxic to humans and ecosystems through bioaccumulation. A recently released EPA report on water quality indicated that all surface water bodies failed to achieve good chemical status (2019 – 2024) in part due to the presence of mercury in fish. Ireland is a signatory of the Minamata Convention on Mercury (2013) which contains provisions to phase out the use of mercury containing products, and tracks emissions of mercury to air, land and water through the European Pollutant Release and Transfer Register (E-PRTR) and the UN Convention on Long Range Transboundary Air Pollution (CLRTAP). The UN Environment Programme (UNEP) developed a toolkit to help countries develop national mercury inventories. This toolkit (inventory level 1 and 2) was used to determine the major sources of mercury pollution and develop a case study on the most significant industrial emitter of mercury in Ireland – alumina production from bauxite (estimated 2,179.2 kg released in 2023). Bauxite naturally contains trace levels of mercury (0.02 – 1.5 mg/kg) and with over 4 million tonnes of bauxite processed annually, the estimated output far exceeds the reported figures. The estimated values were compared to published data, and a mass balance was established. The results indicate that >200 kg per year of mercury is potentially released to the atmosphere each year without any tracking requirement in place, which may contribute to the persistent water quality failures observed. This indicates a huge legislative oversight and does not meet the transparency requirements of the Minamata convention on point-source emissions. There is an urgent need to update Ireland's regulatory framework to include stack monitoring from alumina production to prevent the continuation of hidden mercury releases.

Presentation Type: Oral

Water Table Position Mapping in an Irish Blanket Bog Site Using Vegetation Metrics and Hydrological Monitoring

Muhammad Inam Bari¹, [ORCID](#), Eoin McCarthy¹, Eilish Broderick¹, Patrick Tuohy², Owen Fenton³

¹Department of Biological and Pharmaceutical Sciences, Munster Technological University, Kerry, Tralee, Ireland

²Animal and Grassland Research and Innovation Centre, Teagasc, Moorepark, Fermoy, Ireland

³Environment Research Centre, Teagasc, Johnstown Castle, Wexford, Ireland

Abstract:

Healthy peatlands play a crucial role in maintaining ecosystem services, including biodiversity support, water regulation, and carbon storage. In Ireland, however, peatlands have been extensively degraded due to land drainage, peat extraction, and agricultural land use, resulting in altered hydrological regimes and increased greenhouse gas (GHG) emissions. Despite ongoing national and European efforts to restore peatlands and reduce emissions, a lack of detailed information on peatland drainage conditions remains a significant barrier to effective management. This study aims to enhance the assessment and mapping of peatland drainage status (shallow vs. deep drainage) by integrating high-resolution drone imagery, vegetation surveys, and hydrological monitoring. Seasonal field-based surveys were conducted to record vegetation composition, peat depth, and drainage features, while hydrological data were collected using dip wells to monitor water table fluctuations. A scorecard was used to assess the site vegetation and drainage conditions and their relationship with the water table position. Also, vegetation changes were observed near the installed dip wells using vegetation quadrant scoring. The outcome demonstrates a strong correlation between vegetation and hydrological monitoring data for mapping the water table position in the Blanket Bog site. As a result, this will propose a cost-effective framework for large-scale peatland drainage assessment, contributing to improved peatland mapping, restoration prioritisation, and climate reporting in Ireland.

Presentation Type: Oral

Monitoring and assessing the effectiveness of small-scale wetland ponds as an ecological water quality restoration measure in agricultural catchments

Georgina Mooney¹, [ORCID](#), Marcin Penk¹

¹University College Dublin

Abstract:

Agriculture had been a cause of significant issues in water quality across Ireland. Nutrient and sediment run-off from fields and yards can cause negative impacts on water quality, effecting not only biodiversity, but also recreational and commercial value of lakes and rivers. The implementation of large scale nature based solutions (NbS) to intercept run-off in rural and urban areas has been proven to improve water quality in downstream waterbodies, while also providing biodiversity benefits and visual appeal. However, large scale NbS systems can cause conflict regarding long term management and ownership. Therefore, small-scale NbS systems implemented at an individual farm level as part of agri-environmental schemes may have the potential to locally improve water quality, resulting in catchment-wide benefits depending on the number of systems installed in one area. Wetland ponds are one such small scale NbS systems, mimicking natural pond habitat, that can be installed in wet, unproductive areas within a farm site. These ponds can provide sediment storage via settling within the pond basin and nutrient uptake through the growth of aquatic and riparian vegetation, potentially improving water quality in downstream waterbodies and increasing biodiversity on site through the creation of new wetland habitat.

Presentation Type: Poster with 5 min oral presentation

Tracing legacy pollutants in the Irish marine environment using passive sampling techniques

Marcia Isabel Cadena Aizaga¹, [ORCID](#), Brendan McHugh², Branislav Vrana³, Martha Valiadi⁴, Fiona Regan¹

¹Water Institute and School of Chemical Sciences, Dublin City University

²Marine Institute

³RECETOX, Faculty of Science, Masaryk University, Brno, Czech Republic

⁴Institute for Molecular Biology and Biotechnology (IMBB), Foundation for Research and Technology Hellas (FORTH), Heraklion, Greece

Abstract:

Passive and dynamic sampling devices are transforming the monitoring strategies of legacy pollutants and contaminants of emerging concern in marine systems, offering a powerful alternative to traditional grab-sampling approaches. By providing time-integrated measurements of the bioavailable fraction of contaminants, these tools are particularly valuable in dynamic marine environments, where concentrations are often low and influenced by variable inputs. In this study, silicone rubber sheets were deployed using two passive sampling configurations: mounted on frames in nearshore estuarine and transitional waters and incorporated into dynamic passive sampler (DPS) devices during offshore ship surveys. Samplers were applied to characterise the occurrence of legacy pollutants, including polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides (OCPs), across the Irish marine environment. Preliminary offshore results revealed concentration ranging from 0.5 – 12000 pg·L⁻¹ for PAHs, 0.05 – 46 pg·L⁻¹ for OCPs, and from 0.05 – 1.7 pg·L⁻¹ for PCBs. These findings highlight the ability of passive sampling to capture contaminant signals across a wide concentration range. DPS successfully captured contaminant profiles, demonstrating their sensitivity and robustness in environments where pollutants may be present at trace levels. Overall, this work underscores the complementary strengths of passive sampling and their potential to enhance long-term monitoring strategies for legacy pollutants and emerging contaminants in marine ecosystems

Presentation Type: Oral

Catchment Communities: Development of an Interdisciplinary Framework for Citizen Science-Based Monitoring of Water Quality in Ireland

Nathan Maréchal¹, Chloe Martin¹, Charlotte Bouffeteau¹, Juan Esteban Quintero Marín¹, Fiona Regan¹, Fiona Murphy¹, Padraig Murphy¹, Susan Hegarty¹

¹Dublin City University

Abstract:

One of the primary challenges in water quality monitoring, is the significant amount of resources required to monitor extensive freshwater networks. In the case of the Irish river network, only 4% of all river bodies are actively monitored by the Environmental Protection Agency (EPA), with small-order bodies excluded due to resource constraints. Therefore, there is a critical need to implement additional, reliable data-collection methods. Doing so would allow for better support of policy-making and help authorities achieve the goals established in the European Union Water Framework Directive (WFD). In recent years, citizen involvement has emerged as an effective way to gather reliable water quality data with an improved spatial resolution, complimenting traditional monitoring approaches in a desirable way. In this optic, the Catchment Communities project aims to design a framework for the development of citizen science (CS) water quality monitoring projects, easily scalable to a national scale. To address all aspects of the WFD, the project will cover hydromorphological and physico-chemical elements, while also focusing on anthropological considerations related to citizen science and water quality. This interdisciplinary approach is a key output of the project, as its presence in the framework will be essential for the successful creation of future citizen science projects. This presentation focuses on the physico-chemical part of the project, demonstrating the application of existing and new CS tools to improve data gathering, sample collection, and citizen engagement. The scope of development is driven by WFD needs, data gaps, EPA water quality reports and the potential to develop new robust tools that are reliable and citizen science ready.

Presentation Type: Poster with 5 min oral presentation

A Living Lab Approach to Monitoring and Mapping Invasive Alien Aquatic Species in the Sligo Town Region

Via Narasimhan¹, Emily Schwalbe¹, Giordano Bernardes², Salem Gharbia¹

¹ATU Department of Environmental Science, Atlantic Technological University, Sligo, Ireland

²ATU Department of Mechatronic Engineering, Atlantic Technological University, Sligo, Ireland

Abstract:

Invasive aquatic species pose significant ecological pressures on freshwater systems, contributing to biodiversity loss, habitat alteration, and long-term ecosystem degradation. Mitigation strategies are necessary for biodiversity and ecological conservation. Based on the research gap surrounding IAAS within Sligo, species of interest include Nuttal's Waterweed (*Elodea nuttallii*), Curly Waterweed (*Lagarosiphon major*), Least Duckweed (*Lemna minuta*), American skunk cabbage (*Lysichiton americanus*), Fringed Water Lily (*Nymphoides peltate*) and New Zealand Pigmyweed (*Crassula helmsii*). The current phase of this study involves identifying, mapping, and assessing the ecological impacts of these predominant invasive aquatic plant species within the Sligo Town area. Living lab methodology underpins this work, facilitating collaboration and cocreation of awareness/mitigation strategies among researchers, local stakeholders, community organisations, and members of the public. Through workshops, this project promotes engagement with key stakeholders (ie NGOs, local communities, farmers, industry representatives, etc) and raises awareness regarding IAAS around Sligo Town. This methodology also supports the development of citizen science protocols to support accurate species identification, georeferenced data collection, and standardised reporting procedures. Long-term collaboration with stakeholders and the community ensures the documentation of the distribution and concentration of priority IAAS through systemic mapping surveys. The outcome of this first-year phase will establish a socio-environmental baseline where mapping is combined with stakeholder/community awareness. The latter half of this research will include the generation of novel insights in the lignocellulosic potential of the mapped IAAS. This project demonstrates the combination of scientific assessment within a living lab model and how community participation enhances invasive species monitoring and supports evidence-based environmental management at a regional scale.

Presentation Type: Poster

Detection of Chemicals of Concern in surface waters sampled via Citizen Science

Alexander Savelev¹, Rebecca Smith¹, David O'Connor¹, Marcia Isabel Cadena Aizaga¹, Sen Yan¹, Fiona Regan¹

¹Dublin City University

Abstract:

Rivers and lakes are an important source of drinking water for a large portion of the population. Chemical contamination of surface water presents risks to humans and the environment. A citizen science blitz event was held in order to collect a large spatial degree of surface water samples. Sample kits were sent to volunteer citizens to collect surface water at locations important to them. Citizen scientists collected surface water samples during the weekend of the event and returned them by post. Samples were stored at 4°C in a cold room until extraction and qualitative analysis for pharmaceuticals and pesticides of concern. Fifty samples were reported with rural and urban locations marked as well as different surface water body types. Samples were concentrated in the lab using Hydrophilic-Lipophilic Balance (HLB) Solid-Phase Extraction (SPE) to a smaller volume for analysis. Samples were analysed using two methods: Liquid Chromatography Mass Spectrometry (LC-MS) for pharmaceuticals and pesticides. Among the detections, several chemicals were frequently detected across samples: venlafaxine and its active metabolite desvenlafaxine, clarithromycin, fluconazole, carbamazepine, and gabapentin. Results of this work may inform chemical monitoring in water bodies and highlight the limitations of volunteer sampling events.

Presentation Type: Oral

Preparation of Calibration Protocol to Characterize and Quantify Organic Matter in Synthetic Dairy Wastewater using Fluorescence Excitation–Emission Matrix

Akser Alam Siddiqua Maya¹, [ORCID](#), Michael McAuliffe², Shane Mulcahy³, Brian Murray³, Md Galal Uddin⁴, [ORCID](#), Anna Piterina⁵, SM Ashekuzzaman¹, [ORCID](#)

¹Centre for Advanced Photonics and Process Analysis (CAPPA), Department of Physical Science, School of Science & Informatics, Munster Technological University, Cork, Ireland

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⁵Department of Civil, Structural and Environmental Engineering, and Sustainable Infrastructure Research & Innovation Group (SIRIG), Munster Technological University, Cork, Ireland

Abstract:

The characterization and quantification of organic matter in dairy wastewater are essential for effective process monitoring, treatment optimization, and environmental protection. Fluorescence spectroscopy has emerged as a rapid and sensitive approach for analysing dissolved organic matter in wastewater systems. This study describes the preparation of a calibration protocol to characterize and quantify organic matter in synthetic dairy wastewater using excitation–emission matrix (EEM) fluorescence spectroscopy. Calibration curves were established using model organic compounds representing key wastewater fractions, including protein-like and humic-like materials. Standard solutions of DL-tryptophan, L-tyrosine, and humic acid were prepared across a range of concentrations to evaluate fluorescence responses within characteristic EEM regions associated with Peak A (humic-like), Peak C (fulvic/humic-like), Peak B (tyrosine-like), and Peak T (tryptophan-like) signals. EEM spectra were acquired across defined excitation and emission wavelength ranges, followed by essential pre-processing steps including blank subtraction, inner filter effect correction, and scatter removal. Synthetic dairy wastewater samples were subsequently analysed under identical instrumental conditions. Rather than focusing solely on peak identification, the study examined quantitative relationships between variations in fluorescence intensity across defined regions and conventional water quality indicators, including chemical oxygen demand (COD), biological oxygen demand (BOD), and total organic carbon (TOC). Calibration models were developed to assess the predictive capability of fluorescence signals for these parameters. Initial results demonstrated positive linear relationships between humic-like fluorescence (Peak A and C) and TOC and COD. These findings highlight the potential of EEM fluorescence spectroscopy as an alternative monitoring tool for organic pollution in wastewater, supporting real-time assessment and improved wastewater management through robust calibration using representative organic standards.

Presentation Type: Poster with 5 min oral presentation

Session Theme: Microplastics and Emerging Contaminants in the Environment.

DashMP software: Deep learning automated spectral high-throughput microplastic analysis

Junli Xu¹, Junhao Xie¹

¹University College Dublin

Abstract:

Microplastics (MPs) are widespread and persistent environmental pollutants that pose potential health and ecological risks. Effective monitoring of MPs in the environment is therefore essential for assessing and managing MP pollution. In this work, we present DashMP, a software tool for high-throughput, accurate spectral classification of MPs. The core of DashMP is a convolutional neural network (CNN) that automatically extracts spectral features, thereby minimising the need for manual preprocessing. To accommodate spectra of varying ranges, we developed a variable-length data augmentation strategy, a capability not supported by existing CNN-based MP spectral classifiers. Recognizing that MP identification in real-world environments represents an open-set problem, DashMP integrates both an uncertainty thresholding approach and the OpenMax algorithm to reject unknown classes. Within the optimal uncertainty threshold range of 0.87 ± 0.01 , the model achieved 93.1% accuracy on both the known-class test set (15,741 spectra) and the unknown-class test set (6,279 spectra), demonstrating excellent performance and open-set robustness. Beyond model accuracy, DashMP offers a suite of user-oriented features, including spectral visualization, statistical summaries, and result export functions. It also supports batch inference and integration with hyperspectral imaging workflows, enabling the processing of large spectral datasets, a feature not available in existing CNN-based MP classifiers. Leveraging high-performance GPUs, DashMP can perform inference on five million spectra per second (excluding output operations), providing a scalable and practical solution for automated, high-speed MP monitoring in environmental applications.

Presentation Type: Oral

Holographic imaging and machine learning for microplastic size and shape analysis in water

Ismaila Abimbola¹, [ORCID](#), Thangavel Thevar², Marion McAfee¹, Leo Creedon¹, Hanieh Khosravi¹, Salem Gharbia¹

¹Atlantic Technological University, Sligo

²University of Aberdeen, United Kingdom

Abstract:

Microplastics are a growing global concern, particularly in drinking water, due to their potential negative impacts on human health. To effectively monitor, quantify and understand the sources and implications of microplastics in water, it is critical to characterise their physical and chemical properties. However, existing laboratory-based methods commonly used for characterising microplastics have several limitations. Using a novel method, this study explored the feasibility of quantifying the physical properties of microplastics in water. Specifically, we utilised a portable holographic camera to record digital holograms of commercial microplastics floating in water. We also developed a simple Python algorithm to estimate microplastic size from particle images. This study further evaluated and compared the performance of two deep learning architectures, MobileNetV2 and ResNet101, for classifying the shapes of microplastic particles as spherical or hemispherical. Findings from this study demonstrate the capability of the proposed holographic system to rapidly and automatically produce particle images of microplastics while simultaneously measuring their sizes. Performance metrics, including accuracy, precision, recall, F1 score, confusion matrix and training time, showed that MobileNetV2 achieved the best performance despite being a more lightweight model with fewer parameters than ResNet101. Therefore, MobileNetV2 was recommended for classifying microplastic shapes from particle images. The time and cost-effectiveness of the proposed digital holographic method make it suitable for large-scale monitoring of microplastics in water. This will be significant in identifying the sources, understanding their behaviour and reducing the associated health risks to humans.

Presentation Type: Poster

Application of lignocellulosic and anaerobic digestate-derived biochars for Microplastic adsorption

Jimena Barrientos-Paras¹, Sarah Murnaghan¹, Siobhan Jordan¹

¹Centre for Freshwater and Environmental Studies, Dundalk Institute of Technology

Abstract:

Microplastics (MPs) are synthetic particles of polymers with variable shapes and sizes ranging from 1 µm to 5 mm. It is estimated that 1.5×10^4 – 4.5×10^6 particles of MPs are discharged globally every day from wastewater treatment plants (WWTP) into aquatic environments due to inefficient primary and secondary treatments. MPs easily spread and persist in the environment due to their small size, affecting air quality, soil and water quality, and becoming part of the food chain. Microplastic pollution has raised widespread health concerns as MPs can cause inflammation, toxicity, cellular damage, and neurological disorders in organisms. Biochar has been used for MP adsorption in several studies and has shown good removal potential, with the added benefits of being low-maintenance, low-cost, and easily implemented as a filter medium for MP removal. This study utilised biochars produced at 650–700°C from lignocellulosic biomass and anaerobic digestate to filter different MP types, compared with a sand-based filter medium. Microplastic standards (polypropylene (PP) fibres and fragments, polyethylene (PE) fragments and polyethylene terephthalate (PET) fibres from Microplastic Solutions) were filtered in a 9.1 cm³ biochar or sand filter. Biochars outperformed traditional sand-based filter media for MP adsorption, showing statistically higher removal percentages (82–100% removal in biochar vs. 49–91% removal in sand filters). Biochars show a higher removal percentage of PP fibres and fragments than PE fragments and PET fibres, suggesting that the affinity of biochar can be subject to the polymer type. Preliminary ageing experiments suggest that sand-based filters may achieve higher long-term removal percentages when more microplastics are added, though further research is needed to assess their long-term removal potential.

Presentation Type: Oral

Impact of microplastic fibres on membrane-based wastewater treatment

Liana Zoumpouli¹, John Chew², Bing Wu³

¹University College Dublin, Dublin, Ireland

²University of Bath, Bath, United Kingdom

³University of Iceland, Reykjavik, Iceland

Abstract:

Anthropogenic microplastic fibres, or microfibers, are widely detected in municipal and industrial wastewater and pose risks upon discharge into the environment. Wastewater treatment using membrane filtration can act as a major barrier for microfibre pollution, however the long-term efficiency of the process is compromised by membrane fouling. This study investigated the effects of polyethylene (PE), polyethylene terephthalate (PET), and polyamide (PA) microfibres on the direct membrane filtration of low-strength wastewater. While the presence of microfibres at 10 mg/L did not affect the treated water quality (removal of biodegradable organics and suspended solids), it had a strong effect on fouling behaviour. Key parameters that affected filtration performance and fouling mechanisms included the microfibre material (PE, PET, PA), microfibre length (1, 5, 20 mm), membrane morphology, and filtration mode. In crossflow filtration (tangential flow) using track-etched membranes with well-defined pores, the microfibres resulted in higher transmembrane pressure and fouling resistance than the control. In contrast, in dead-end filtration (perpendicular flow) using mesh-like nanofibre membranes, the microfibres mitigated fouling, suggesting the important role of flow conditions in microfibre transport. Under the different conditions tested, the microfibres also influenced the deposition of soluble organics (e.g., fulvic acids) and scalant cations (e.g., Mg²⁺) on the membrane, indicating diverse interactions between microfibres, other foulants and the membrane surface. Overall, this study elucidated the effects of microfibres on membrane filtration, supporting the development of resilient filtration systems for complex wastewater matrices containing microplastics.

Presentation Type: Oral

Upgrading slow sand filtration: exploring the practicality of traditional technology for the 21st century

Hayley Corbett¹, [ORCID](#), Brian Solan¹, [ORCID](#), Svetlana Tretsiakova-McNally¹, [ORCID](#), Pilar Fernandez-Ibañez², [ORCID](#)

¹Belfast School of Architecture and the Built Environment, Ulster University, United Kingdom

²School of Engineering, Ulster University, United Kingdom

Abstract:

Water stress is intensifying globally due to rising demand and declining quality. The goals of this research were two-fold: to unlock previously unusable wastewater effluent for re-use and improve the standard of water post-treatment. Slow sand filtration (SSF), an established approach to wastewater treatment, is still effectively used worldwide, particularly in resource-poor regions. A traditional SSF reactor was built in this study, then later reconstructed replacing a section with sawdust, a novel and sustainable material; both were asynchronously investigated for their capacity to remediate water of antibiotics and common surface water nutrients, nitrate and phosphate. Each filter was operated in a recirculating setup over four weeks to enable the development of the biological component known as “Schmutzdecke”. Standard water-quality testing indicated that the hybrid sawdust filter could buffer the impact of shock events (e.g., turbidity spikes) while still supporting a healthy Schmutzdecke. Furthermore, the sawdust layer facilitated greater microbial activity, which is associated with adsorption and biodegradation of various contaminants and pathogenic microorganisms. However, upon exposure to simulated wastewater effluent spiked with selected antibiotics (1 mg.L⁻¹ each), sulfamethoxazole (SMX) and trimethoprim (TMP), negligible differences in removal efficiency were observed between the traditional and hybrid SSFs. SMX removal was low in both traditional and hybrid filters; median removals (n=3) were 3.7% (1.2 - 38.6%) and 2.0% (1.4 - 3.4%), respectively. However, TMP removal exceeded 93% in each case. Further analysis of the mechanisms of interaction between contaminants and the filter material revealed that SMX removal is highly pH-dependent and independent of contact time. We can conclude that even given a greater residence time, it is unlikely that the more persistent compounds like SMX will be removed from aqueous solutions by SSF. This underscores the need to control and prevent these compounds from entering water bodies from the outset.

Presentation Type: Oral

The Impact of Smoked and Non-smoked Cigarette Filters on Aquatic Ecosystems using *Daphnia* as Bioindicators

Anne Leung¹, [ORCID](#), Maria Eleni Tsioli¹, David Mittag¹, Martin Krauss², Konstantinos Grintzalis¹

¹Dublin City University

²Helmholtz Centre for Environmental Research

Abstract:

Cigarettes are the most littered item in the world - 4.5 trillion cigarettes are discarded every year. Most of these contain filters which can introduce toxic chemicals and plastics into waterbodies. Therefore, the assessment of the ecotoxicological effects of smoked and non-smoked cigarette filter extracts is necessary. Using the freshwater organism *Daphnia*, this study compares the toxicity and sublethal effects of the two filter types. Toxicity in the crustaceans was assessed by measuring mortality following exposure to increasing concentrations of cigarette filter extracts. Survival was analysed using the Kaplan-Meier method, and growth was measured as body length over time. Enzyme activities associated with physiological stress and metabolism were also quantified. Acute toxicity was observed only for smoked cigarette filter extracts, with mortality occurring from 100 mL extract/L. Smoked filters had an EC₅₀ of 397 mL extract/L, corresponding to eight cigarette filters after 48 hours of exposure. In chronic exposures, non-smoked filters did not cause more than 50% mortality at any tested concentration, whereas smoked extracts caused up to 100% mortality at high concentrations. Growth responses differed between extract types and concentrations, with younger daphnids showing greater sensitivity. Size changes observed after one week were reduced by week two and three, also suggesting partial adaptation. It was also revealed that cigarette filters can influence changes in enzyme activity. Overall, cigarette filters exhibited significant ecotoxicological effects on daphnids. However, the effects are likely not unique to daphnids as pathways of toxicity are shared even among distantly related species. This highlights their risk to freshwater ecosystems on a much broader scale.

Presentation Type: Oral

Urban Drains to Coastal Waters: Sub-Kilometre Analysis of PFAS from Stormwater Outfalls

Helen Burke¹, Leila Bowe¹, Yulong Ma², M. Isabel Cadena-Aizagaa¹, Stuart Harrad², Fiona Regan¹

¹Dublin City University

²University of Birmingham, United Kingdom

Abstract:

PFAS are a large group of man-made chemicals, defined by the OECD as any compound with a (-CF₃) or (-CF₂-) moiety. This strong carbon-fluorine bond renders these compounds resistant to degradation and imparts hydrophobic properties. These physico-chemical properties are highly attractive to industry, with PFAS utilised across a range of sectors. However, these same properties contribute to the persistence of PFAS in the environment. Widespread use and resistance to degradation have made PFAS ubiquitous in the natural environment. Even in areas without fluorochemical production, such as Ireland, PFAS can enter the environment through industrial and municipal wastewater, firefighting activities, and urban runoff, often travelling through stormwater networks before being discharged to surface waters. This study aimed to explore the influence of stormwater outfalls on the concentration of 33 PFAS in the Liffey Estuary, Dublin, Ireland. Sub-kilometer sampling was conducted at individual outfalls along the river to assess variability in PFAS loadings. Water samples were extracted by solid-phase extraction and analysed by high-pressure liquid chromatography coupled with time-of-flight mass spectrometry. Twenty-four PFAS were detected across the estuary, including long-chain compounds and their short-chain replacements. PFAS concentrations ranged from 6.20 - 91.48 ng/L, with highest total concentrations downstream of waste treatment facilities. Spatial variation in PFAS class profiles was evident across the upper and lower estuary, with the number of PFAS detected ranging from 2 - 14 compounds. Detections varied markedly between outfalls within a few hundred metres of each other. Multivariate analysis indicated that stormwater outfalls act as a diffuse source of PFAS in the Liffey Estuary, and that unique PFAS profiles are attributed to localised inputs such as waste facilities and marina activities. These findings highlight the need for high-resolution spatial monitoring to improve PFAS source attribution and understanding of mobility pathways in urban surface waters.

Presentation Type: Oral

Engaging Citizen Scientists in PMT/vPvM Chemical Monitoring: A Community-Based Training and Sampling Approach

Rebecca Smith¹, Alexander Savelev¹, Fiona Regan¹, Isabel Cadena Aizaga¹, Sen Yan, Patrick Sode¹, Susan Hegarty¹, Liam Morrison², David O'Connor¹

¹Dublin City University

²University of Galway

Abstract:

Water quality is essential for maintaining environmental integrity, human health and global economic stability. However, anthropogenic pressure and global population increase have led to a global decrease in water quality, greatly increasing stress on freshwater sources. In Ireland, this issue is particularly significant due to the widespread reliance on groundwater sources, private wells, and Group Water Schemes in rural communities. Emerging contaminants, including Persistent, Mobile and Toxic (PMT) and very Persistent, very Mobile (vPvM) substances, pose a significant threat to drinking water and surface waters due to their high mobility, persistence, and resistance to conventional wastewater treatment processes. Despite increasing regulatory attention, monitoring of these compounds remains spatially limited, with smaller water bodies and rural catchments often underrepresented in traditional sampling campaigns. Moreover, traditional sampling of water for scientific research is constrained by a research project's resources, limiting the temporal and spatial sampling resolution achievable. A novel solution to this problem is the recruitment of citizen scientists, voluntary members of the general public with an interest in scientific research, to collect samples on behalf of the project team for a more cost effective and representative sample cohort. This study, conducted as part of the EPA-funded PERMOTOX project, evaluates the use of a nationwide Citizen Science "Water Blitz" to enhance monitoring of PMT/vPvM substances in Irish surface waters. This approach allows scientists to allocate more time to data analysis and interpretation, ultimately improving project efficiency and impact. The approach contributes to ongoing discussions on the development of robust, scalable citizen science methodologies for environmental monitoring and management. It is hoped that this will, in turn, strengthen environmental data collection and support more comprehensive freshwater management strategies.

Presentation Type: Poster

Session Theme: 14. Policy, Governance and Sustainable Development.

Aligning Building Geometry with Environmental Conditions: A Spatial Assessment of Rooftop PV Performance in Ireland

Aiza Ahmad¹, [ORCID](#), Evan Finegan¹, Niamh Power¹

¹Munster Technological University

Abstract:

Photovoltaic (PV) systems are key component of renewable energy strategies and climate change mitigation, yet their real-world performance is strongly shaped by environmental conditions, geographical location and building design. In temperate maritime climates such as Ireland's, these influences are especially significant but are often overlooked in standard assessment tools, leading to uncertainty in PV performance estimates. This study presents a spatially resolved, data-driven evaluation of residential rooftop PV performance across Ireland, focusing on the combined effects of roof orientation, tilt angle and regional climatic variability. PV performance simulations were conducted using PV*SOL Premium, supported by high-resolution Meteonorm meteorological data. A total of 155 locations were analysed on a 0.25° latitude–longitude grid, incorporating nine roof orientations and three tilt angles (15°, 30° and 45°). Two-way ANOVA and Tukey post hoc tests were used to assess the statistical significance of orientation–tilt interactions and regional differences in PV yield. The results show that roof geometry plays a dominant role in determining annual PV output. South-facing systems with a 30° tilt produced the highest yields, while southeast- and southwest-facing systems achieved near-optimal performance with deviations of less than 7%. In contrast, north-facing configurations experienced yield reductions exceeding 45% relative to optimal conditions. Even with identical roof configurations, spatial analysis revealed up to 18.6% variation in PV yield between regions, highlighting the importance of location-specific environmental factors. Comparison with Ireland's national DEAP assessment framework indicates systematic underestimation of PV output by 4–11.6%. These findings demonstrate that building-level design choices and location-specific environmental analysis can significantly improve PV performance estimates, with direct implications for housing design standards and national energy policy. Incorporating such data-driven optimisation approaches can support more accurate renewable energy planning, sustainable building design and accelerate decarbonisation of the residential sector.

Presentation Type: Oral

Planning for sustainable, low-carbon, and healthy food access in Ireland: empirical evidence from a national survey

Daniel Burke¹, [ORCID](#), Paul Hynds², Anushree Priyadarshini¹

¹Maynooth University

²Technological University Dublin

Abstract:

Everyday food consumption is shaped not only by individual preferences but by the spatial and infrastructural systems that organise access to retail. This research examines how mobility infrastructures and retail networks jointly produce spatial inequality in Ireland's 'foodscape', and how these place-based conditions relate to dietary outcomes and body mass index (BMI). Drawing on Central Place Theory and New Economic Geography, we analysed a national online survey of adults in Ireland (n = 957) capturing proximity to food retailers, settlement type, usual travel modes, diet indicators, and BMI. Using cluster analysis, four distinct spatial–mobility profiles were identified: Urban-Pedestrians (n = 219; 23%), Urban-Drivers (n = 412; 43%), Rural-Drivers (n = 258; 27%), and Mixed-Multimodal (n = 68; 7%), each profile was significantly associated with socioeconomic and health characteristics, as well as different consumption patterns. Urban pedestrian and multimodal cohorts reported shorter travel distances to retailers and exhibited healthier dietary profiles (i.e., vegetable- and seafood-focused diets), with lower mean BMI (Urban-Pedestrians: 25.8; Mixed-Multimodal: 24.8). Conversely, rural and car-dependent cohorts were associated with longer travel distances, less favourable dietary patterns (i.e., meat- and potato-focused diets), and higher mean BMI (Rural-Drivers: 28.0; Urban-Drivers: 27.3). These findings highlight accessibility as an infrastructural mechanism, such as transport costs, settlement dispersion, and retail concentration, and how they interact to structure local consumption opportunities and reproduce uneven development through everyday practices. Thus, policies and governance related to sustainable development must target spatial mobility groups with tailored measures, such as improving public transport, diversifying retail options, and promoting local nutrition initiatives, to alleviate health and socioeconomic inequities and co-benefits for public health and sustainable mobility transitions.

Presentation Type: Oral

Just Transition Indicators in Agri-Food Systems: A Systematic Literature Review

Aon Waqas Awan¹, Tracey O'Connor¹, David Barry¹

¹Circular Bioeconomy Research Group, Centre for Applied Biosciences Research, Munster Technological University, Tralee, Ireland

Abstract:

The Just Transition (JT) perspective is increasingly applied to agri-food systems. However, unlike the other industrial contexts from which JT emerged, the agri-food context is not only a source of greenhouse gas emissions but also presents substantial climate mitigation opportunities, e.g., nature-based solutions, and climate adaptation potential, e.g. flood management. These characteristics require adjustment of the JT approach to the agri-food context. However, there is a lack of knowledge about appropriate analytical frameworks and indicators for evaluating JT in agri-food systems. To address this knowledge gap, a systematic literature review (SLR) of frameworks, indicators and metrics for assessing agri-food JT was conducted following PRISMA guidelines. A search of three databases (Scopus, Web of Science, and EBSCOhost) identified 1,749 relevant articles, of which 1,240 remained after duplicates were removed. Following review to assess eligibility, 1,161 articles were removed. The remaining 79 peer-reviewed studies were examined to understand how justice was conceptualised and translated into measurable indicators across agri-food transitions. The SLR shows a growing but weak evidence base. For example, environmental indicators like greenhouse gas emissions, land and water use, biodiversity effects, and resource efficiency are comparatively fully developed and commonly embedded within scenario modelling and systems analyses. On the other hand, justice-related distributive-indicators (livelihood security; income stability; food affordability; health exposure), procedural indicators (participation quality; representation; transparency; institutional accountability), and recognition-based measures (labour rights; cultural identity; youth and smallholder inclusion) are inconsistently operationalized. Furthermore, justice-linked indicators are rarely included in integrated frameworks applied to sustainability analyses. Justice is often treated implicitly, with social equity dimensions framed as contextual rather than co-equal performance criteria. The review identifies a persistent “justice gap”: the deficiency of balanced JT indicator systems that integrate justice dimensions. Therefore, it requires co-produced, multi-dimensional indicators that embed power analysis.

Presentation Type: Oral

Making a Splash: Environmental Sustainability Policy Integration in Irish Water-Based Sporting Bodies.

Ailish. M. O' Brien¹, [ORCID](#), Barry O' Sullivan¹, [ORCID](#), Karen, D. Hennessy¹

¹South East Technological University, South East, Ireland

Abstract:

Sporting organisations are increasingly recognised as influential actors in environmental sustainability and climate action. However, involvement is often ad hoc. The integration of environmental commitments into mainstream policy is considered essential for organisations to transition towards strategic engagement with environmental sustainability. Previous research by Hennessy, O'Sullivan, & O'Brien (2025) provides a broad overview of environmental policy integration (EPI) across all Olympic Federation of Ireland (OFI) affiliated national governing bodies (NGBs). While the authors identified limited evidence of a coordinated national effort, it was noted that water-based sports tended to embrace environmental sustainability in a substantive manner. Building on this insight, and framed from a sport ecology perspective, this paper undertakes an in-depth examination of EPI in water-based sport NGBs for the period 2020 to 2025. For the purposes of this study, water-based sport NGBs are Canoeing Ireland, Rowing Ireland, Irish Sailing, Irish Surfing, Swim Ireland, and Triathlon Ireland. Using a multi-step content analysis approach, seven categories of publicly available documents were identified and collected from water-based sport NGB websites. Documents were subsequently analysed using Cury et al's. (2023) four parameter policy integration framework. Data analysis is almost complete and full findings will be presented at Environ2026, corresponding with the Cury et al (2023) four parameters of Signalling, Coverage, Scope, and Alignment. Signalling refers to the number of relevant document types. Coverage assesses the extent to which environmental sustainability references are substantial. Scope assesses the environmental focus of documentation, and Alignment considers the extent documentation refers to external policies and frameworks. In addition, examples of best practice across NGBs will be provided, alongside commentary on the relevance of green leadership and support from international sports federations. This paper advances knowledge of environmental sustainability involvement and EPI In Irish sporting contexts and highlights the important role sport can play in climate action.

Presentation Type: Oral

BioCultúr - Proposing the need for a biocultural bioeconomy

Jamie Murray^{1,2}, [ORCID](#), Máire Nic an Bhaird^{1,2}, [ORCID](#), Laoise Ní Chléirigh^{1,2}, [ORCID](#), Tom Curran^{2,3} [ORCID](#)

¹Maynooth University, Maynooth, Ireland

²BiOrbic, Dublin, Ireland

³University College of Dublin

Abstract:

The bioeconomy has emerged as a central framework within European and national sustainability strategies, promoted as a pathway towards decarbonisation, circular resource use, and green economic transformation (European Commission, 2018; OECD, 2009). However, scholarship highlights persistent conceptual instability and competing paradigms within the field, alongside critiques that dominant policy framings remain technocratic and innovation-led, often prioritising industrial competitiveness over social and cultural dimensions. Studies of public perception across Europe further indicate that awareness of the bioeconomy remains low and unevenly distributed. This presentation draws on an ongoing doctoral research project investigating the links between culture, heritage, language and bioeconomy transitions, with particular focus on Ireland. The first component synthesises a comprehensive interdisciplinary literature review examining bioeconomy definitions, policy narratives, and critiques, alongside research on environmental meaning-making, identity, and place. The review identifies an absence of culture, heritage, and language within dominant European bioeconomy discourse, despite evidence that sustainability engagement is shaped by cultural interpretation and social trust. Building on this theoretical foundation, the second component presents findings from a national survey exploring public awareness, understanding, and perceptions of the bioeconomy in Ireland. The survey investigates familiarity with the concept and the social, cultural, and educational factors influencing engagement. Early analysis suggests that limited awareness coexists with strong place-based environmental values and identity-linked understandings of sustainability, indicating that culturally grounded framing may strengthen public engagement with bioeconomy policy. By combining conceptual analysis with empirical national data, this research proposes a “biocultural bioeconomy” approach that recognises transitions as social and cultural processes as well as technological and economic ones. The findings contribute to debates on sustainability governance, environmental education, and public participation in environmental transition.

Presentation Type: Oral

Embedding Soil Literacy within Education Governance: Evidence from the LOESS Project Implementation

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Abstract:

Across Europe, between 60–70% of soils are estimated to be in an unhealthy condition, with degradation driven by surface sealing, erosion, compaction and depletion of biodiversity and of soil organic carbon. Whilst the EU Mission 'A Soil Deal for Europe' policy framework positions soil health as foundational to climate change mitigation, biodiversity conservation and food security, formal education systems across member states remain insufficiently aligned with these governance priorities. This paper presents an analysis of the LOESS (Literacy boost through an Operational Educational Ecosystem of Societal actors on Soil health) project- a Horizon Europe initiative involving a twenty-institution transdisciplinary consortium- as an intervention at the interface of education policy and environmental governance. Operating across fifteen European countries, LOESS has employed a mixed-methods approach to gather information on gaps in soil health education. This comprised desk research, educator surveys, focus groups and interviews, structured within national Communities of Practice (CoPs) integrating soil scientists, educators, policymakers and civil society actors. Identified deficits include fragmented curricular treatment of soil health and the insufficient integration of experiential and civic-oriented pedagogies such as Community Engaged Research and Learning (CERL). In response, LOESS is co-developing an educational ecosystem encompassing co-created courses and modules including an augmented reality application for visualising soil ecosystem services, a CERL module for higher education lecturers, a community-based crowd-mapping platform, and a European Atlas of Soil Education and Training. Drawing on interim deliverables and implementation frameworks from this ongoing project, this presentation advances the argument that soil literacy constitutes an educational governance competency. Embedding participatory, place-based and policy-linked pedagogies within higher education would position universities as mediating institutions between scientific knowledge systems, civic actors and local land-use decision-making, thereby strengthening adaptive capacity for sustainable soil stewardship. More details about the project and resources can be found at <https://loess-project.eu/>

Presentation Type: Oral

Why Sustainable Feed Innovations Struggle to Translate into Adoption: A Macro-Environmental Evidence Map of Duckweed-Derived Protein in Europe

Rakesh Rayapureddi¹, [ORCID](#), Anushree Priyadarshini¹

¹Maynooth University, Maynooth, Ireland

Abstract:

The European Union remains only 25% self-sufficient in high-protein feed, while alternative proteins account for less than 2% of the market. Despite strong policy commitments to EU circular bioeconomy transitions and protein diversification, uptake of bio-based feed innovations remains marginal. This persistent disconnect between environmental ambition and market deployment highlights a structural transition challenge within European feed systems. This study investigates how macro-environmental conditions shape the development and adoption of sustainable feed innovations across Ireland, the UK, and the EU, using duckweed-derived protein as a diagnostic case. A structured PESTLE-based scoping review synthesised peer-reviewed research alongside regulatory, policy, and investment evidence to map political, economic, social, technological, legal, and environmental influences across feed value-chain stages. This analysis focuses on identifying recurring macro-environmental patterns that constrain adoption pathways for duckweed-derived protein feed. Although duckweed's biological feasibility and nutrient efficiency are consistently supported in the scientific literature, regulatory authorisation processes, classification ambiguities, and fragmented compliance requirements generate prolonged uncertainty that delays commercial scaling. In addition, existing investment and market-formation mechanisms remain weakly aligned with sustainability objectives, shifting transition risk onto early innovators despite policy-level commitments to circular protein systems. Similar governance and coordination gaps are observed across adjacent bio-based sectors, indicating that adoption constraints are systemic rather than crop-specific. By reframing sustainable feed innovation as a macro-environmental systems challenge, this study underscores the need for integrated decision-support frameworks that align technical capabilities with policy-enabled deployment. The resulting evidence synthesis supports sustainable practice adaptation by providing governance-relevant insights for regulators, policymakers, and agri-environmental stakeholders working to enable environmentally responsible feed transitions in Europe.

Presentation Type: Oral

Meeting in the middle? The interplay of targets and institutional support in Ireland's phase out of hydrofluorocarbons

Zack Twamley¹, Adam Boland¹, Jack McCarthy¹, [ORCID](#), Safaa Al-Tameemi², Niall O'Leary³, Colum Gibson⁴

¹Rediscovery Centre - the National Centre for the Circular Economy, Dublin, Ireland

²Clean Technology Centre (MTU), Cork, Ireland

³Hincks Centre for Entrepreneurship Excellence, Cork, Ireland

⁴Clean Technology Centre (MTU), Cork, Ireland

Abstract:

Hydrofluoro-carbons are used in refrigeration and air conditioning systems globally but can have Global Warming Potential thousands of times higher than that of CO₂. The European Union's F-Gas Regulation aims to eliminate the use of these gases by 2050, gradually reducing the supply of HFCs placed on the EU market. Refrigeration and air conditioning technicians are positioned as a key broker in achieving this target. These professionals require the skills and support to carry out the practical work of replacing and decommissioning existing HFC systems, and to install and maintain new systems that use non-f-gas alternatives. However, training levels in these new technologies vary across the EU. This research explores this challenge in the Irish context. It draws upon semi-structured interviews with 19 Irish and EU sectoral stakeholders, and a comparative analysis of Ireland's training framework with that of Denmark - a best-in-class example. Based on these activities, the availability and adequacy of training were identified as key shortcomings in relation to achieving EU policy objectives. Moreover, a number of key factors were identified for incorporation into Ireland's policy implementation. These include establishing physical training facilities, aligning third-level apprenticeship training with skills and technologies that utilise low-GWP alternative gases, building stronger links with regulators and industry to monitor and update such courses, and establishing an appropriate system for upskilling the existing labour force. These findings speak to wider environmental policy debates, specifically highlighting the need to calibrate and translate central formulated policy initiatives to institutional contexts at a variety of spaces and scales. The research is funded by EPA Open Research. Project number 2024-GCE-1247

Presentation Type: Oral

AI-Powered Energy Profile Tool for Rural Energy Communities

Avinash Nagarajan¹, [ORCID](#), Marting Hill¹, Benjamin Kaiser¹

¹Munster Technological University, Cork, Ireland

Abstract:

The EU has recognised the important role that Energy communities and citizen-driven energy actions can play in the clean energy transition. To support emerging groups to establish an energy community, tools are required to help participants in understanding the energy performance of their housing stock, evaluate retrofit opportunities and set decarbonisation targets. Ireland's Building Energy Rating (BER) scheme provides detailed assessments of individual premises but has a high and individually borne cost, often leaving communities without the baseline data needed for informed collective action. The CIRCUS project (Interreg NWE) aims to increase energy resilience in rural communities across North-West Europe by equipping them with tools for energy profiling and participatory decision-making. Within this context, we present a tool that provides a first energy estimate for any Irish dwelling from its Eircode. While not as accurate as a BER assessment, it is designed to engage and educate communities about their energy consumption and retrofit options. The system implements a five-phase pipeline: (1) geocoding the Eircode to GPS coordinates, (2) fetching satellite and Street View imagery at four angles, (3) classifying the building using a multimodal large language model that cross-references views to identify construction era, building type, storeys, and heating system, (4) extracting the building footprint via AI vision with computer vision fallback, and (5) computing an indicative energy rating using the HWB annual balance method with epoch-specific U-values and Irish climate data. The tool is not intended to replace professional BER assessments but serves as a community-facing engagement tool: enabling energy communities to rapidly profile local housing stock, identify dwellings most likely to benefit from retrofit, and give householders an accessible starting point for exploring options. Demonstration across diverse Irish dwelling types shows that the tool can correctly identify building typology, providing useful energy estimates for community-level planning within CIRCUS.

Presentation Type: Oral

Creative Climate Action as a Catalyst for Transformative Community Change

Michelle Burke¹, Joanne Mac Mahon¹, Maria RuizCarerras¹, Michael Lydon², Marguerite Nyhan¹

¹University College Cork, Cork, Ireland

²University of Galway, Galway, Ireland

Abstract:

Creative C-Change is a research project that evaluates the impact of the Creative Climate Action programme on climate change engagement, action & behaviour change in Ireland. The Creative Climate Action programme is a government initiative that supports creative, cultural, and artistic projects to raise awareness about climate change and encourage collective action. Through findings from Creative C-Change, this conference paper examines how the initiative cultivated necessary conditions for transformational change within communities, building their capacity and resilience to climate change. Community development practice increasingly recognises that lasting climate action requires not only behavioural shifts but also changes in relationships, culture, empowerment and capacity building. While the Creative Climate Action programme was designed primarily to support behavioural change, its creative, practical, and dialogic elements generated broader community development outcomes. Drawing on qualitative data collected from Creative C-Change, this study explores how the creative environment encouraged participants to engage with climate challenges in new and proactive ways. It was found that the formation of novel spaces was a significant factor in the effectiveness of the projects' interventions. This refers to the unique creative and social spaces provided by the projects that helped to foster greater social investment in climate action. The novel spaces enhanced social connection, dialogue, co-generation of solutions and knowledge sharing through creative activities, thereby demonstrating the power of collaboration to communities and increasing their collective ability to pursue climate action. This conference paper argues that creative, arts-based approaches can act as catalysts for transformational change in communities by influencing social dimensions that are often overlooked in climate policy. For community development, the findings highlight the value of integrating cultural strategies alongside behavioural interventions. The study offers insights for practitioners designing context-specific climate initiatives that seek not only to spread innovations but to anchor them in the cultural fabric of communities.

Presentation Type: Oral

Advancing Sustainable Transition in Maritime SMEs: The Impact4Mar Transnational Approach in the Atlantic Area

Jeovan A. Araújo¹, [ORCID](#)

¹Centre for Polymer Sustainability, Applied Polymer Technologies Gateway, Technological University of the Shannon

Abstract:

The maritime sector is central to Europe's Blue Economy and to the protection of marine and coastal habitats. However, small and medium-sized enterprises (SMEs) within this sector face growing regulatory and market expectations to systematically assess and disclose sustainability-related Impacts, Risks and Opportunities (IRO) across Environmental, Social and Governance (ESG) dimensions. In the context of evolving European Union sustainability frameworks, including the European Green Deal and the United Nations 2030 Agenda, many maritime SMEs lack tailored methodologies and practical tools to implement robust IRO–ESG assessment processes. The Interreg Atlantic Area project Impact4Mar addresses this challenge by developing and validating an integrated methodology to support IRO–ESG assessment in maritime SMEs across Atlantic regions. The project begins with a comparative analysis of existing sustainability and ESG assessment practices within regional maritime ecosystems. Based on this baseline, it prototypes a sector-specific Toolkit that enables SMEs to identify, prioritise and manage environmental and climate-related impacts and risks, while also recognising innovation and competitiveness opportunities linked to sustainable transformation. The Toolkit is tested through pilot actions in maritime SMEs and refined through transnational knowledge exchange among project partners and stakeholders. Results are consolidated through a digital platform and targeted bootcamps designed to build capacity and encourage long-term adoption. Impact4Mar supports the adoption of sustainable production practices within maritime value chains and strengthens environmental governance at the regional scale by embedding a structured IRO–ESG assessment into business decision-making. The project demonstrates how harmonised, SME-focused methodologies can operationalise sustainability policy objectives into measurable actions, contributing to resilient coastal habitats and a more sustainable Atlantic Blue Economy.

Presentation Type: Oral

Session Theme: Sustainable Water: Management and Water Conservation.

Shiga toxin-producing *E. coli* (STEC) serogroups in private groundwater wells: frequent and persistent detection in increasingly vulnerable hydrogeological settings

David Greaney¹, Leah Doherty¹, Florence De Bock¹, Robert J Hynes¹, [ORCID](#), Zina Alfahl¹, [ORCID](#), Louise O'Connor¹, Catherine Burgess², [ORCID](#), Paul D Hynds³, [ORCID](#), Jean O'Dwyer⁴, [ORCID](#), Liam P Burke¹, [ORCID](#)

¹University of Galway, Galway, Ireland

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⁴University College Cork, Cork, Ireland

Abstract:

Background: Unregulated private groundwater supplies are widely used for drinking water in Ireland and represent an important transmission route for waterborne pathogens including Shiga-toxin producing *Escherichia coli* (STEC). Objectives: To investigate the presence of six human infection-associated STEC serogroups in groundwater wells in three hydrogeologically distinct catchments during the peak human infection period. Methods: Three sub-catchments with extreme, high, and moderate groundwater vulnerability (according to Geological Survey Ireland) were selected for field studies. Groundwater wells (n=13-14 per catchment, 40 total) were sampled fortnightly from June to September 2025 and assessed for *E. coli* (MPN/100 mL) using Colilert 18[®]. For *E. coli*-positive samples, 1 L was filtered (0.45 µM), the filters were enriched in mTSB, and Shiga toxin (stx1 and stx2) detection was performed on DNA extracts by real-time PCR. Stx1/2-positive samples were assessed for six serogroup-associated genes by real-time PCR. Results: *E. coli* was detected in 68/234 (29%) samples and STEC (stx1/stx2) in 28 (12%) samples. There was greater STEC detection in the extreme (n=20/82, 24%) vs the high (n=6/75, 8%; p=0.009, Fisher's Exact test) and moderate (n=2/77, 3%; p<0.0001) vulnerability catchments. The overall STEC-to-*E. coli* detection ratio was 1:2.43, with ratios of 1:1.95, 1:3.16, and 1:5 in the extreme, high, and moderate vulnerability catchments, respectively. Serogroups O157 (n=8 detections, 29% positivity in STEC samples), O145 (n=8, 29%), O104 (n=7, 25%) and O103 (n=6, 21%) were present, with 7 samples positive for multiple serogroups. O26 and O111 were not detected. Conclusions: Frequent detection of viable *E. coli*, stx1/2 genes, and genetic markers for 4 serogroups associated with hundreds of STEC enteritis cases annually in Ireland highlights the likely importance of groundwater wells in STEC transmission, particularly in hydrogeologically vulnerable catchments. The non-detection of the most common human infection serogroup, O26, may reflect differences in transmission pathways.

Presentation Type: Oral

Potential Source Water Protection Measures to Mitigate Against Organic Matter Using Ireland as A Case Study.

Valerie McCarthy¹, [ORCID](#), Katherine Molloy¹

¹Dublin City University, Dublin, Ireland

Abstract:

Dissolved organic matter (DOM) is found across all freshwater systems and originates from soils, leaf litter and leachate from plant material and the decomposition processes. High concentrations of DOM in water react with chlorine during water treatment, forming harmful disinfection by-products (DBPs). There are numerous options available to mitigate and treat DBPs as part of the water treatment process, including a range of technologies and management procedures which aim to reduce contact between DOM precursors and disinfectants. Nevertheless, protecting water at source represents an alternative, and likely additional, activity that could reduce DBP formation in drinking water in a more cost-effective and efficient way. Source Water Protection (SWP) through the use of Nature Based Solutions and other methodologies has been widely implemented in many regions of the world to improve raw water quality. However, compared with other potential contaminants, such as microbial pathogens, very little work has specifically focused on reducing DOM input to water treatment plants. This study provides a review of the potential and feasibility of implementing SWP measures to mitigate DOM and provide clean drinking water, using Ireland as a case study. Input was gathered from the Irish water sector via a semi-structured focus group and an online survey to evaluate the perceived issues, barriers and solutions to the effective implementation of SWP measures at the catchment scale. The findings suggest a potential role for SWP in mitigating DOM in source water, leading to improved DBP management in conjunction with treatment plant improvements and upgrades. However, there is currently a lack of evidence-based research demonstrating the effectiveness of SWP measures in mitigating against DOM and DBP formation which is a significant barrier to the uptake and implementation of such measures.

Presentation Type: Oral

Improving Water Quality in cross-border catchments through nature-based solutions and community actions to meet Water Framework Directive goals

Paige Kenny¹

¹Atlantic Technological University, Sligo, Ireland

Abstract:

Many of Ireland's freshwater bodies still fail to reach 'good ecological status' under the Water Framework Directive despite ongoing efforts, highlighting the need for targeted catchment-scale work. According to the EPA, just 52% of our surface waters were in satisfactory condition, which is a deterioration from the previous monitoring period from 2016-2021. FLOW (For Love of Our Waters) is a three-year cross border project (2025-2028) funded by SEUPB under the PEACEPLUS programme that seeks to protect and restore specific lakes and rivers in cross-border regions. The project focuses on four target catchments on the border: Lough Melvin, Lough MacNea, the Swanlinbar/Cladagh River, and the Kilroosky/Magheraveely Lake Cluster. The project aims to address declining water quality in these priority catchments by examining agricultural pressures, wastewater discharge, soil erosion, surface runoff, the control and prevention of invasive species, and improving health. An important part of the project will focus on monitoring water quality by measuring nutrient loads (N and P), assessing baseline data, evaluating improvements in water quality following the implementation of riverine Nature-Based Solutions (NBS), and analysing blue-green algae (cyanobacteria) and their toxins. Extensive water sampling and lab-based analyses will be carried out, using various approaches such as the application of biological indicators (e.g., macroinvertebrates, fish, and environmental DNA [eDNA]), the acquisition of physico-chemical data, and the promotion of community engagement through citizen science. Although the project is at an early stage, FLOW is designed to deliver measurable improvements in water quality, strengthen cross-border cooperation, and increase local stakeholder engagement in protecting and managing water resources. This poster outlines the project's plans and anticipated contributions to the delivery of the 3rd Cycle River Basin Management Plans (2021-2027).

Presentation Type: Poster

Catchment-to-Reach Scale Modelling of Sediment Dynamics using Integrated SWAT and HEC-RAS: Application to the River Mulkear Catchment, Ireland

Liton Chandra Mazumder^{1,2}, [ORCID](#), Joe Harrington², Branislav Batel², Vincent Hussey³, Bidroha Basu^{1,2}

¹Department of Civil, Structural and Environmental Engineering, Munster Technological University, Cork, Ireland

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³Office of Public Works, County Meath, Ireland

Abstract:

Sediment impacts on river catchments and river systems are a major global issue and challenge, affecting channel morphology, water quality, aquatic habitats, and flood risk through processes such as erosion, sedimentation, and excessive sediment loading. These impacts are increasingly intensified by climate change, as more frequent extreme floods and droughts alter sediment mobilisation, transport, and storage dynamics. The River Mulkear Catchment (~650 km²) located in the mid-west of Ireland experiences substantial sediment loadings during high-flow events. These events include the transfer of coarse sediment into the Old Shannon channel near Annacotty located upstream of the Shannon-Mulkear confluence, contributing to long-term aggradation and increased flood risk. This paper develops a hydrological model to quantify sediment behaviour at the catchment scale in the River Mulkear. The Soil and Water Assessment Tool (SWAT+) has been applied to simulate rainfall-runoff processes, soil erosion, and sediment yield across different land-use types and soil classes at the sub-basin level. Daily outputs of discharge, suspended sediment load and sediment yield from SWAT+ will be used as the upstream boundary conditions for a hydrodynamic (in HEC-RAS) sediment transport model. These inputs will support hydrodynamic sediment transport modelling, allowing dynamic simulation of bedload, suspended sediment, and bed changes under unsteady flow conditions. The coupled hydrologic and hydraulic models will ultimately enable assessment of climate change and land-use impacts on sediment behaviour at the catchment scale, supported by available field observations, identify critical sub-catchments and erosion hotspots, and inform evidence-based flood risk management and sustainable river sediment management. This integrated modelling approach will support policymakers and stakeholders in prioritising interventions and strategic catchment planning, while proposing a comprehensive methodology to bridge hydrological and hydraulic processes in sediment management studies.

Presentation Type: Oral

Erosion-driven soil carbon dynamics in a headwater agricultural catchment dominated by microtopography

Prosper Kpiebaya^{1,2}, [ORCID](#), Sharon O'Rourke³, [ORCID](#), Lilian O'Sullivan¹, [ORCID](#), Per-Erik Mellander², [ORCID](#), Russell Adams², Giulia Bondi², [ORCID](#)

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Abstract:

Soil erosion processes impact soil organic carbon (SOC) dynamics, which directly affect soil health, agricultural productivity, and climate change mitigation. Understanding how erosion redistributes SOC across landscapes is therefore critical for sustainable soil management. This study presents an integrated catchment modelling framework to quantify erosion-driven SOC redistribution and labile carbon export in a grassland-dominated headwater catchment in South-East Ireland. Spatial patterns of soil erosion and deposition were simulated using the Revised Morgan–Morgan–Finney (RMMF) model, incorporating high-resolution topographic, soil, vegetation, and climatic data. Model outputs were coupled with systematic and hotspot-targeted soil sampling to assess SOC and water-soluble carbon (WSC) as a proxy for labile carbon fraction. Model results reveal highly heterogeneous erosion-deposition dynamics, with erosion hotspots up to 2 kg ha⁻¹ yr⁻¹ and deposition rates ranging from <10 to 67 kg ha⁻¹ yr⁻¹ strongly controlled by microtopography and flow convergence. These processes resulted in estimated SOC redistribution of 32.00 to 117.07 g C ha⁻¹ from erosion hotspots, with partial downslope storage in depositional hotspots (35.14 to 125.89 g C ha⁻¹). Catchment-scale estimates indicate that a substantial proportion of mobilised carbon is exported via hydrological pathways, with labile C export ranging from 0.12 to 29.89 g C m⁻². Spatial analysis shows that labile C export is strongly associated with hydrologically sensitive areas and connected slope positions. These findings demonstrate that microtopography and hydrological connectivity exert first-order controls on both sediment and carbon fluxes, even under relatively low erosion rates typical of grassland systems. The proposed framework provides a scalable, process-based approach for linking erosion modelling with SOC and labile C dynamics, offering improved capacity to assess carbon budgets and target soil conservation and carbon sequestration measures at catchment to regional scales.

Presentation Type: Oral

Rescuing Lost Records: Virtual Gauging of a Decommissioned River Station Using a Hierarchical Machine-Learning Framework

Tuan Booso¹, [ORCID](#), Ahmed Nasr¹, [ORCID](#), Zeinab Bedri¹ [ORCID](#)

¹Technological University Dublin

Abstract:

Long-term streamflow records are fundamental to flood risk assessment, hydrodynamic modelling, and water-resources management. However, these records are increasingly disrupted by sensor failure, extended data gaps, and permanent station decommissioning. In Ireland, a recent hydrometric network assessment has identified the need for approaches that preserve continuity of hydrological monitoring beyond the lifespan of physical gauging infrastructure. This study presents a hierarchical, availability-adaptive machine-learning framework for reconstructing missing hourly discharge under realistic operational conditions. The framework dynamically switches between multiple donor-based predictive models according to real-time availability of upstream stations, enabling continuous reconstruction without reliance on fixed predictor sets. The methodology is demonstrated using the Claregalway gauging station in the Clare River catchment, western Ireland. The station was decommissioned in 2023, creating a critical data gap along a downstream reach that is highly susceptible to frequent flooding, thereby underscoring the operational implications of hydrometric data loss. As part of the development of the hierarchical, availability-adaptive machine-learning framework, Multiple Linear Regression, Random Forest, and Artificial Neural Network (ANN) models were trained and evaluated using independent testing data. Model performance was assessed using standard hydrological metrics, including Nash–Sutcliffe Efficiency (NSE), Kling–Gupta Efficiency (KGE), coefficient of determination (R^2), and percentage bias. All models achieved strong predictive skill (NSE and $R^2 > 0.90$), with the availability-adaptive ANN providing the most balanced performance across flow regimes and generating smooth, physically consistent hydrographs suitable for downstream modelling. The results demonstrate that hierarchical, availability-adaptive learning can transform decommissioned hydrometric stations into operational Virtual Gauging Stations, preserving long-term discharge records under realistic data-availability constraints. The proposed framework offers a transferable, low-cost solution for sustaining hydrological information in data-limited catchments and directly supports flood-risk assessment, hydrodynamic simulation, and water-quality applications.

Presentation Type: Oral

Contrasting phosphorus build-up and drawdown dynamics in grasslands with differing soil structure.

Patti Roche¹, Mary Harty², John Cleary¹, Samuel Browett¹, Sara Vero¹

¹South East Technological University, Waterford, Ireland

²University College Dublin, Dublin, Ireland

Abstract:

Structure refers to the arrangement of soil particles and is often described as the soil's architecture. This is because soil structure refers to the physical arrangement of soil particles, like the building blocks in a wall. These particles bind together to form aggregates, and to create pores within and between aggregates. These aggregates and pores influence root penetration and water movement, and thus affect nutrient dynamics. Phosphorus (P) is a macronutrient, essential for crop growth. Certain forms of P are not available to the plant for uptake, referred to as legacy P. This legacy P can be made available under certain conditions including optimal pH and good root development. The influence of soil structure on the availability and release of legacy soil P stores is not fully understood. Consequently, there are limited options to improve the mining of P reserves, and current fertiliser recommendations are predominantly based on soil chemistry. The hypothesis of the present research is that poor soil structure impedes changes in P index and mobilisation of P reserves. While poorly structured soils may be more difficult to change chemically, structural improvements could allow a more effective manipulation of indices. The influence of soil structure on mobilisation and availability of phosphorus was examined through a pot trial. Results indicate that in soils with high P levels, poorly structured soils showed less drawdown of legacy P reserves than well-structured soils. In soils with low P levels, well-structured soils were more efficient at utilising applied P mineral fertilisers and therefore built-up greater P reserves than poorly structured soils. Management of soil structure may therefore present as a means to utilise both applied mineral fertilisers, and legacy P reserves in the soil.

Presentation Type: Oral

Analysing the role of stakeholder engagement within the Irish water governance system

Mahak Sharma¹, [ORCID](#), Suzanne Linnane¹, David Getty¹, Sarpong Hammond Antwi¹, Caroline Gilleran Stephens¹

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Abstract:

Ireland's freshwater quality is relatively good and water is fairly abundant, according to Water Action Plan 2024. However, natural water systems are being severely impacted by issues like growing nutrient pollution, urban pollution and physical changes; as a result, nearly half of the surface water bodies in Ireland failing to achieve 'good' ecological status under the Water Framework Directive (WFD). Climate-related extremes, including floods and droughts, underscore the growing need for adaptive, integrated water governance in Ireland. However, fragmented stakeholder coordination and engagement continue to constrain the achievement of sustainable water management outcomes. This study undertakes a structured analysis of stakeholder dynamics within Ireland's water governance system, focusing on the Group Water Scheme (GWS) sector and key water management organisations. Using a survey-based interest-power-legitimacy framework, this research conducts systematic stakeholder salience mapping to assess perceived interest, power and legitimacy across sectors. It further examines patterns of interaction and collaboration, analyses engagement strategies and communication mechanisms, and evaluates barriers, challenges and outcomes influencing sustainable water management. A mixed methods design was employed using two sector specific surveys. Quantitative data were analysed using statistical techniques to identify trends in stakeholder interest, power, legitimacy and patterns of collaboration, while qualitative responses were examined through thematic analysis to explore perceptions, challenges and enabling factors. By integrating stakeholder mapping with governance analysis, the study provides a systematic assessment of engagement dynamics within Irish water management. The findings will inform the development of a strengthened stakeholder engagement framework aimed at enhancing inter-organisational cooperation, adaptive governance capacity and long-term sustainability outcomes. Key Words: Stakeholder engagement, Group Water Schemes, water management.

Presentation Type: Oral

The role of individuals in driving sustainable water consumption behaviour within regulatory institutions in Ireland

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Abstract:

Ireland's transition toward sustainable water consumption is shaped by interacting governance and institutional-level drivers embedded within EU regulatory frameworks and national policy reforms. At the governance level, EU water directives promoting integrated resource management, quality standards, and cost-recovery mechanisms have catalysed structural reforms, including the establishment of Uisce Éireann, supported by reports from the Irish Environmental Protection Agency, and the introduction of volumetric pricing. Institutionally, persistent infrastructure deficits, high leakage rates, and limited regulatory capacity undermine service efficiency and public trust. Current research indicates that while efforts have been made to influence sustainable consumption standards, significant disparities remain in practice. These include limited longitudinal evidence on behavioural responses to pricing and feedback technologies, insufficient integration of cultural analysis within policy evaluation, and weak multi-level assessment frameworks linking governance reform to institutional practices. Addressing these gaps through coordinated, multi-scalar research, this project aims to explore water consumption behaviour at the individual level across governance and institutional sectors to provide deeper insight into the latent requirements embedded within contemporary practices. Through this approach, the study seeks to generate evidence that can support more effective and context-sensitive policy implementation to advance sustainable water consumption for water regulation institutions by emphasizing the practices taken towards achieving this by individual actors. This will be achieved through the application of Reflexive Thematic Analysis to qualitative datasets, enabling the identification of key themes reflecting participant perspectives on water consumption across different systemic levels. This will provide an analysis of the latent psychological and structural drivers influencing behaviour, supporting the development of a model to enhance water governance in Ireland.

Presentation Type: Oral

What's up, DOC? A review of dissolved organic carbon concentration and export patterns in temperate and boreal river catchments.

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²Department of Geography, University College Cork, Cork, Ireland

Abstract:

Rising dissolved organic carbon (DOC) levels in rivers and streams across temperate and boreal regions pose multiple threats to water quality and to the global carbon balance. This has stimulated extensive research into the climatic, hydrological and biogeochemical controls on DOC dynamics in surface waters. Despite this no synthesis has systematically evaluated patterns and trends across catchment-scale monitoring studies. We conducted a systematic scoping review of catchment-scale DOC monitoring studies published between 2004 and 2024 across the Northern Hemisphere and Ireland, following the PRISMA-ScR framework. Data on DOC concentrations and export from 93 eligible studies were extracted, standardised, and analysed to assess regional patterns, land-use influences, and long-term trends. Distinct regional patterns emerged in DOC concentrations with the highest values reported by Boreal Europe (15.27–65.78 mgL⁻¹), with elevated values in Finnish catchments. Land-uses affected by disturbance of organic soils, including forest clear-felling, peat extraction, and restoration, were consistently associated with higher DOC concentrations (57.98–111.28 mgL⁻¹) relative to less disturbed catchments on mineral and mixed soils (<50 mgL⁻¹). When it comes to annual DOC export, which incorporates catchment size and discharge into measured DOC concentrations, the patterns shift. The highest DOC exports reported by Oceanic Europe (5.05–18.45 gm-2year⁻¹) and Continental Europe (9.00–13.72 gm-2year⁻¹), highlighting that concentration-based assessments alone do not fully capture the nature of catchment-scale carbon dynamics. Long-term studies across the Northern Hemisphere consistently reported multi-decadal increases in DOC, while short-term studies provided insight into DOC responses to land-use change. Notably, Ireland was underrepresented within the reviewed literature. Given Ireland's extensive peat soil coverage and ongoing land-use changes, this limits a national-scale understanding of DOC dynamics. Our synthesis highlights the need for long-term, standardised DOC monitoring in Irish catchments to distinguish climatic trends from land-use impacts and to inform water-quality and carbon-management policy.

Presentation Type: Poster

Session Theme: Marine and Coastal.

Where does organic matter come from in Irish saltmarshes?

Saule Akhmetkaliyeva¹, [ORCID](#), Robert Sparkes², [ORCID](#), Eliza Fairchild¹, Ragna Hoogenboom¹, Grace Cott¹, [ORCID](#)

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Abstract:

Coastal blue carbon ecosystems are among the most effective carbon sinks, yet Irish saltmarshes, covering 4,000-6,500 hectares, remain understudied in terms of carbon sources. Understanding sources of organic matter is essential for assessing their long-term carbon sequestration potential and management. This study analysed stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) in saltmarsh sediment cores from Derrymore Island (DI) and North Bull Island (NBI), Ireland. $\delta^{13}\text{C}$ values (-30.09‰ to -21.64‰ at DI; -29.30‰ to -23.52‰ at NBI) decrease upmarsh, indicating a stronger terrestrial signal, particularly at DI, while $\delta^{15}\text{N}$ values are higher at the urban site, NBI (5.39‰ to 9.67‰) than at DI (3.79‰ to 6.48‰). In line with this, Bayesian stable isotope mixing models indicate that C3 saltmarsh vegetation contributes more strongly to organic matter upmarsh. Elevated $\delta^{15}\text{N}$ values at NBI indicate anthropogenic nutrient influence, consistent with wastewater-derived nitrogen inputs from the nearby wastewater treatment plant. No comparable enrichment is evident at the non-urban site (DI). These results highlight that C3 plants are the main source of organic matter in Irish saltmarshes, while showing that nutrient cycling in urban marshes is influenced by human-derived inputs.

Presentation Type: Oral

Non-Invasive Marine Species Detection: Rapid, Field-Deployable eDNA Assays using CRISPR-Cas Technology in the MariBiome Project

Mitch Wosinski¹, Nicolette Sale¹, Luke Griffin², Tousif Redwan Yamim³, Dinesh Babu Duraibabu³, Gerard Dooley², Fiona Regan¹, Paulo Prodohl⁴, Anne Parle-McDermott¹

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Abstract:

Non-invasive monitoring of species in the marine environment has traditionally relied on visual observation and manual counting methods that are labour-intensive, time-consuming, and error-prone. Environmental deoxyribonucleic acid (eDNA) based detection offers a compelling alternative, enabling precise species-specific detection from simple water samples. However, current eDNA detection methods typically rely on quantitative polymerase chain reaction (qPCR) or DNA sequencing, which require central laboratory facilities or expensive portable devices. These constraints limit both accessibility and rapid-response capabilities, which are critical for monitoring invasive or threatened species. The MariBiome Project aims to develop on-site eDNA testing solutions using recombinase polymerase amplification (RPA) coupled with CRISPR-Cas technology to detect target marine species that are indicators of ecosystem change or of concern. This system will support the development of rapid, affordable, and highly specific molecular assays targeting marine species relevant to an Irish coastal context. Furthermore, it enables detection of Harmful Algal Blooms (HABs) and norovirus in water samples. This approach will also enable the potential integration of autonomous sensing methods, through interdisciplinary collaboration with other researchers under the MariBiome Project. The MariBiome Project (Grant-Aid Agreement No. PBA-BIOD-24-02) is carried out with the support of the Marine Institute under the Marine Research Programme, and funded by the Government of Ireland. It is expected that this research will advance the practical implementation of CRISPR-Cas-based eDNA detection and demonstrate its applicability for marine monitoring.

Presentation Type: Poster

Community Engaged Research for Coastal Challenges

Emily Schwalbe¹

¹Atlantic Technological University

Abstract:

As the severity and consequences of coastal erosion become more urgent with the increasing impacts of climate change, an important issue for researchers is how to communicate information and develop solutions on the ground that are acceptable to and sustainable for the communities that live along the coast. One strategy is co-creation of solutions alongside stakeholders, where community members are active participants in developing resolutions that work for their communities alongside researchers. The EU-funded PRO-COAST project applies this approach in case studies throughout Europe, including Ireland. ATU Sligo is a case study leader for PRO-COAST and employs roundtable discussions, workshops, surveys, and other strategies to work with communities to map and stabilise beaches. The structure of the community engagement work is iterative and multi-stage, allowing different opportunities for stakeholders to engage and provide feedback. This approach is not without challenges, however, as different stakeholders hold diverse priorities, goals, and positions in the community. Building off the experiences of PRO-COAST, this paper will present the strengths and difficulties of community-based co-creation methodologies in coastal settings through the case study of Streedagh Beach, Co. Sligo. The presentation will describe approaches to stakeholder engagement, proposed solutions to erosion issues developed in these meetings, and the success of implementing these approaches.

Presentation Type: Oral

The Effect of Elevated CO₂ and Temperature on the Carbon Sequestration Potential of Saltmarsh Grasses *Puccinellia maritima* and *Spartina anglica*

Ragna Hoogenboom¹, [ORCID](#), Grace Cott¹, [ORCID](#)

¹. University College Dublin, 3. University College Dublin

Abstract:

Temperate saltmarsh ecosystems are effective at converting atmospheric carbon into stored soil carbon. Climate change, characterised by a rise in temperature and elevated atmospheric CO₂, is a key driver in the functioning of plants, which is an important determinant of the carbon sequestration rate and stability of saltmarsh ecosystems. This study investigates how climate change affects morphological and physiological traits of saltmarsh grasses *Spartina anglica* (C4 photosynthesis) and *Puccinellia maritima* (C3 photosynthesis). Based on IPCC predictions, the grasses were exposed to three climate change scenarios of enriched atmospheric CO₂ and increased temperature, grown separately and together to test for competitive advantage, due to their distinctive photosynthetic mechanisms. Results showed that future climate stimulates shoot biomass growth across climate scenarios in both *P. maritima* (+90%) and *S. anglica* (+120%) when grown together. When grown alone, *S. anglica* doubled its biomass investment in the roots (101%). The increased growth was driven by higher water-use efficiency, enabling greater carbon uptake without water loss, combined with lower respiration. Biomass increases indicate that future saltmarshes will remain valuable climate mitigation assets by capturing and storing atmospheric carbon. Increased investment in below-ground biomass results in an elevated carbon sequestration rate through direct input of carbon from plant roots into the soil and, indirectly, by facilitating the trapping of allochthonous carbon-rich sediment. As climate change continues to pose a threat, the elevated carbon sequestration rate of temperate saltmarsh ecosystems in the future suggests the potential for these ecosystems to serve as resilient and stable carbon sinks.

Presentation Type: Oral

Investigating Spatial Distribution of Soil Carbon in an Irish Saltmarsh Ecosystem

Eliza Fairchild¹, [ORCID](#), Grace Cott¹, [ORCID](#), Saule Akhmetkaliyeva¹, [ORCID](#), Ragna Hoogenboom¹, [ORCID](#)

¹University College Dublin, Dublin, Ireland

Abstract:

Coastal wetlands are highly productive blue carbon ecosystems that sequester substantial amounts of atmospheric carbon in their soils. Although carbon stocks vary across saltmarsh landscapes, the extent to which this variability is driven by elevation, soil depth, and vegetation community remains unclear. Identifying the dominant controls on soil carbon distribution is therefore critical for refining blue carbon assessments. Soil carbon dynamics were investigated in an Irish saltmarsh on Derrymore Island, Co. Kerry, where two soil cores were collected from 30 randomly distributed sites. At each sample site, a vegetation survey was conducted and classified using the ERICA app to determine Irish Vegetation Classification. One core per location was used to measure bulk density, %C, and water-extractable SOC, while the second, where possible, was used for soil porewater extraction. Across the marsh, soil %C (determined via loss on ignition at 450 °C) ranged from 0.97% to 38.46%, generally decreasing with depth and from upper to lower marsh zones. Although upper marsh sites exhibited higher %C, they were limited by shallow refusal depths during coring, often due to subsurface stones. In contrast, lower marsh areas, particularly *Spartina agg.* (SM1B) communities, allowed cores exceeding 1 m. Soil carbon data are being interpolated in ArcGIS along with NDVI data from Landsat 2 to determine the total soil carbon stock of the saltmarsh on Derrymore Island. This ongoing project contributes essential data to advancing the scientific understanding of carbon dynamics in Irish saltmarshes. By linking vegetation and spatial characteristics to soil carbon storage, this research aims to improve stock assessments, inform management practices, and provide deeper insights into the carbon sequestration capacity of Irish saltmarshes.

Presentation Type: Oral

Integrated Technical and Economic Evaluation of Irish Floating Offshore Wind Site Options

Krzysztof Szczepaniec¹, [ORCID](#)

¹Centre for Renewables and Energy (CREDIT), Dundalk Institute of Technology

Abstract:

Recent geopolitical shifts and rapid growth in energy-intensive sectors such as data centres and artificial intelligence have elevated diversification and security of energy supply to strategic national priorities critical for political stability and sustainable economic growth. Ireland has one of Europe's best offshore wind resources, yet much remains untapped. Despite advancing legislation, the lack of a comprehensive spatial inventory of Irish waters constrains policy delivery and impedes the identification of optimal sites for floating offshore wind farm (FOWF) development. This study addresses that gap by producing a detailed inventory of Irish waters and identifying Areas of Interest (AOIs) for FOWF deployment. A two-stage methodological framework was applied: an exclusion phase removing incompatible zones, followed by a detailed evaluation phase, the primary focus of this presentation. The evaluation differentiates AOIs using wind and marine parameters aligned with International Electrotechnical Commission site-compliance procedures—a novel approach in multicriteria site selection. To complement technical assessment, the framework integrates economic appraisal using standard financial metrics and employs objective, quantifiable criteria, reducing reliance on subjective expert weighting. The selected AOI covers 437,000 km²—roughly one-tenth of the original Exclusive Economic Zone study area—with an estimated theoretical capacity near 175 GW. Mean hub-height (150 m) wind speeds across the AOI range from 10.2 to 11.4 m/s, with projected annual energy yields of 81–88 GWh per turbine and mean water depths around 260 m. Spatial analysis highlights the Celtic Sea and Irish Sea as most favourable for near-term FOWF deployment when jointly considering wind resource, bathymetry, and economic indicators. Atlantic sectors offer higher resource potential but require further study to address deeper waters, harsher conditions, and higher costs. The findings provide a spatially explicit, metrics-driven basis for prioritising sites, supporting policy implementation, and guiding phased deployment.

Presentation Type: Poster

Data-Driven Coastal Resilience: Integrating FAIR Data, Environmental Monitoring, and Digital Tools to Support Nature-Based Climate Adaptation

Naga Venkata Sudha Rani Nalakkurthi¹, [ORCID](#), Salem Gharbia¹ [ORCID](#)

¹Atlantic Technological University, Sligo, Ireland

Abstract:

Coastal regions are increasingly exposed to climate-driven hazards, including sea-level rise, extreme wave events, and flooding, creating an urgent need for evidence-based adaptation strategies. While advances in environmental modelling and monitoring technologies have improved risk understanding, significant challenges remain in transforming heterogeneous datasets and emerging sensing technologies into actionable knowledge for local decision-making. This research presents an integrated, data-driven approach to coastal resilience that combines FAIR (Findable, Accessible, Interoperable, Reusable) data principles, calibrated environmental monitoring, and digital tools designed to evaluate the performance and co-benefits of Nature-Based Solutions (NBS). Long-term environmental datasets were harmonised to support robust hazard characterisation, while low-cost sensor deployments were assessed and validated to enhance spatial and temporal monitoring capacity. In parallel, digital platforms were examined for their ability to quantify environmental and socio-economic indicators associated with NBS interventions, enabling a more comprehensive evaluation of adaptation outcomes. Applied within the context of the European SCORE project, this work provides practical insights into integrating data governance, sensor validation, and analytical platforms within collaborative coastal Living Labs. The results demonstrate that aligning these components can bridge the gap between environmental observation and climate adaptation planning, support transparent risk assessment, and strengthen the operational uptake of ecosystem-based strategies in coastal management. These findings highlight that effective climate resilience depends not only on generating environmental data, but on ensuring its quality, interoperability, and usability within decision-support frameworks capable of guiding sustainable coastal adaptation.

Presentation Type: Oral

Combining Satellite, Sensors and Citizen Science for Coastal Monitoring: A Systematic Review

Haram Riaz¹, Salem Gharbia¹, Shagufta Henna¹, Noelle Jones¹

¹Atlantic Technological University, Sligo, Ireland

Abstract:

Coastal areas are facing many threats from sea-level rise, storms, and human activities, so effectively monitoring them is crucial. However, traditional field surveys and official reports can be expensive and infrequent. This systematic review examines recent research that combines satellite imagery, low-cost sensors, and community data to improve coastal monitoring. This systematic review follows PRISMA guidelines. We searched scientific databases (ScienceDirect) and selected sixty relevant studies from the past decade. These studies were grouped into themes. Some focus on detecting changes in shoreline position, often using satellite images and machine learning. Others predict erosion or sediment movement using affordable wave and water level sensors. Some map coastal flooding and hazard zones using a mix of remote sensing and field data. Many articles also involve local volunteers taking photos or making simple measurements (often called citizen science). The combined approaches often provide a more complete picture of coastal dynamics. For example, integrating sensor data with satellite observations can capture rapid changes that satellites alone cannot. Several studies report good accuracy when comparing different methods. Key findings include that ML models predicted coastal changes with high accuracy, and that volunteer observations helped capture rapid changes missed by surveys. Using multiple tools gives more frequent and detailed information than traditional single methods. Most of the studies considered in this study come from Europe, North America, and Asia, indicating global interest in coastal monitoring. This review highlights how mixed monitoring strategies can help communities respond to coastal hazards and suggests directions for future work, such as standardising methods and expanding community engagement.

Presentation Type: Poster

Anthropogenic activity in a coastal urban area: Occurrence of pesticides, pharmaceuticals, and UV filters in Dublin Bay

Patrick Sode, [ORCID](#), Marcia Isabel Cadena Aizaga, Flora Calviac, Fiona Regan

¹Dublin City University

Abstract:

Coastal environments near major cities are continuously exposed to chemical pollutants from diverse sources: agriculture, wastewater effluents, runoff, and recreational use. Dublin Bay is a suitable site for exploring anthropogenic activity in a coastal system across both water and sediment. The purpose of this study was to characterise the occurrence, distribution, and partitioning between water and sediment samples of selected pesticides, pharmaceuticals, and sunscreen agents, to evaluate how their presence reflects human activity in the area. Surface water and sediment samples were collected from key locations around the Bay, taking agricultural, wastewater discharge, and recreational factors into consideration. Water samples were preconcentrated using solid phase extraction (SPE), while sediment samples were extracted using solvent based methods followed by SPE. Target-based analysis was performed using liquid chromatography coupled to a triple quadrupole mass spectrometer (LC-MS/MS). Analytical performance was assessed through recoveries, matrix effects, and detection limits relevant to marine testing. A wide range of contaminants was detected, with clear geographical patterns linked to human activity in their respective areas. Pesticides were more abundant at northern sampling sites, likely due to agricultural activity in the area. Pharmaceutical and sunscreen agents were detected at sites associated with wastewater discharge and recreational activity. Repeated detection of contaminants across multiple sites highlights the complex nature of their occurrence and distribution in the coastal environment. These findings provide a chemical profile of Dublin Bay and show how combining water and sediment analyses can lead to an understanding of distinct features of human activity in the coastal environment. These results can influence monitoring strategies in urbanised marine environments to better combat the introduction of these contaminants.

Presentation Type: Oral

Analysis of Seawater and Oysters from Dublin Marine Coasts for Contaminants of Emerging Concern

Nicolette Sale¹, Fiona Regan¹, M. Isabel Cadena-Aizaga¹, Helen Burke¹
Dublin City University, Dublin, Ireland

Abstract:

Contaminants of emerging concern (CECs) are defined as compounds that pose potential risks to ecosystems and human health but are not generally monitored or regulated. These compounds can be challenging to monitor due to their diverse sources, physicochemical properties, and ubiquitous presence in the environment at trace levels. Biomonitoring is one method for investigating contaminants in marine systems. Marine bivalves have long been recognised as crucial ecological and bioindicator species within coastal ecosystems. Their wide distribution, sedentary nature, high filtration rates, and ability to bioaccumulate various contaminants make them exceptionally suitable for monitoring CECs. In Ireland, few studies on CECs focus on monitoring their levels in seawater or comparing biota with traditional grab sampling methods. This work aims to continuously monitor seawater and oyster samples from Dún Laoghaire and Greystones Harbour, following the deployment of thousands of oysters in 2025. This is part of an oyster reef development project in collaboration with Green Ocean Foundation, seeking to develop and scale oyster reef systems in Ireland. The contaminants examined include pharmaceuticals, pesticides, PFAS, nutrients, and metals. Seawater and biota samples were extracted using solid-phase extraction for analysis on an LC-MS/MS system. A matrix-matched calibration curve was generated to assess matrix effects. Along with target analysis, three cartridges underwent non-target analysis to ascertain any additional compounds in the samples. Preliminary results from seawater samples collected before oyster deployment indicate the presence of pharmaceuticals and pesticides at seven sites studied. These include antibiotics, antimicrobials, ultraviolet filters, nonsteroidal anti-inflammatory drugs, herbicides, insecticides, and fungicides. Azithromycin, carbamazepine, clarithromycin, erythromycin, mefenamic acid, trimethoprim, and venlafaxine were confirmed at every site. Pesticides fluconazole and thiabendazole were also found to be ubiquitous across sites. This baseline provides important information for tracking trends in marine contaminants over time and for studying oyster uptake and removal of these contaminants.

Presentation Type: Oral

Optimum Solutions for Saltmarsh Hydrological Restoration

Harry Kelly¹, [ORCID](#) Grace Cott¹, [ORCID](#), Stephen Barry², Shane Regan¹, [ORCID](#)

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²Technological University Dublin, Dublin, Ireland

Abstract:

Saltmarshes are among the most productive and valuable coastal ecosystems, providing critical services including carbon sequestration, nutrient cycling, habitat provision, and act as natural coastal defences. Despite their importance, saltmarshes are under increased pressure from sea-level rise, altered hydrology, coastal development, and grazing. These stressors disrupt natural tidal exchange, sediment delivery, and vegetation dynamics, leading to marsh degradation and reduced resilience. Given the growing vulnerability of coastal systems due to climate change, there is a need to study the processes that control saltmarsh function and recovery to inform effective restoration solutions. This project investigates the hydrology and geochemistry of an intact saltmarsh (control) site at Derrymore Island in Co. Kerry, compared to three degraded saltmarshes in estuarine areas. At all study sites, we will assess key hydrologic parameters including tidal inundation frequency and duration, porewater salinity, and groundwater/surface water exchange. Installation of a network of piezometers at different depths across the study areas will allow the characterisation of sub-surface hydrologic conditions and groundwater–surface water interactions. Water quality parameters will also be studied such as pH levels, dissolved organic carbon, and nutrient levels. This data will improve our understanding of subsurface connectivity and recharge processes enabling us to understand how degradation affects saltmarsh hydrology and to apply that insight to design and implement effective restoration strategies for these vital ecosystems.

Presentation Type: Poster

Wild seaweed systems in Europe: an evidence-based assessment of their relevance for blue carbon accounting

Ana Julieth Calderon Marquez¹, [ORCID](#), Beatrice Smyth¹, [ORCID](#), Pamela Walsh¹ [ORCID](#)

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Abstract:

Blue carbon has become an important component of climate mitigation policy, integrating selected coastal ecosystems into greenhouse gas accounting frameworks. Seaweed systems have recently entered this debate because of their high productivity and large spatial extent, particularly in Europe where interest in seaweed-based climate strategies is expanding. However, it remains uncertain whether wild seaweed systems meet the evidentiary standards required for inclusion in formal blue carbon accounting. This review addresses that gap by systematically assessing empirical evidence from European wild seaweed systems. Sixteen empirical studies were evaluated using a structured classification framework based on three accounting-relevant criteria: long-term carbon storage lasting more than 100 years, feasibility of monitoring and verification, and demonstrable net climate benefit after accounting for losses and variability. Review and policy literature were examined to contextualise these findings. The findings show that no assessed wild seaweed system currently satisfies all three criteria simultaneously. Evidence for durable carbon storage was rare and highly context-specific. Monitoring approaches were generally site-based and not readily scalable to inventory-level reporting. Net climate benefit was frequently reduced or offset by greenhouse gas emissions and temporal instability. These findings clarify the limits of current empirical evidence and highlight a structural mismatch between current assessment of macroalgal carbon dynamics and accounting requirements. The study advances the field by providing a transparent framework for distinguishing ecological importance from accounting eligibility, cautioning against premature carbon crediting while supporting conservation and ecosystem-based management approaches.

Presentation Type: Oral

Smart Pebbles in Coastal Citizen Science: Lessons from Environmental Co-Monitoring with Local Communities at Killiney Beach, Ireland

Juan Esteban Quintero-Marin^{1,2}, Harish Daruari¹, Chiara Cocco¹, Alessandro Pozzebon³, Ercole Diana⁴, Duccio Bertoni⁴, Chiara Favaretto³

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Abstract:

Citizen science is gaining momentum as a means to expand data collection, address spatial and temporal gaps, and increase public engagement in environmental research. Water-related citizen science initiatives have grown substantially in Europe, particularly in response to the objectives of the WFD, which emphasizes community involvement. The CoRe-ACTS project, funded by the ScienceUs Academy, uses Smart Pebbles, a low-cost RFID-based technology designed to track sediment movement and coastal erosion in pebbled beaches. RFID tags embedded within individual pebbles allow recovery using handheld RFID readers, enabling the reconstruction of movement paths and abrasion over time. CoRe-ACTS is a small-scale, community-based initiative focused on coastal resilience, community empowerment, and citizen science. It aims to test and validate the Smart Pebbles methodology while developing a protocol that can be replicated in other contexts. This includes all project phases, from co-design and preparation to deployment, monitoring, analysis, dissemination, and scaling. While the project has contributed to increased public awareness of coastal processes, improved beach-scale data collection, and the development of a scalable citizen science framework, several challenges have emerged. Ensuring data transparency, providing accessible dashboards, and clearly demonstrating the value and impact of citizen-collected data remain central challenges for maintaining engagement and supporting replication. Other challenges include technical bottlenecks in tools and data workflows, which can delay field activities and require alternative solutions, as well as time and staffing demands, which may limit scalability. Achieving a better balance between a scientifically valid method and a user-friendly protocol is also critical. Project outputs include maps of sediment patterns, raised awareness, and a transferable protocol for scaling up the method. Some improvements during this testing phase in Killiney include an easy-to-use workflow in the methodology, better citizen science-friendly technology to improve citizen participation, and other trade-offs between scientific rigour and accessibility for volunteers.

Presentation Type: Poster with 5 min oral presentation

From Effluent to Beach: Metagenomic Mapping of Clinically Relevant Antibiotic Resistance Gene Hotspots in a Coastal System

Sergio Sanchez-Carrillo¹, [ORCID](#), Niamh Cahill¹, [ORCID](#), Dearbháile Morris¹, [ORCID](#)

¹University of Galway

Abstract:

Background Antimicrobial resistance (AMR) is an escalating One Health threat driven by antimicrobial use and environmental dissemination of resistance determinants. Coastal zones are key sentinels because they integrate human and agricultural wastewater inputs with exposure via recreation and seafood consumption. Objectives To profile the resistome—including clinically relevant antibiotic resistance genes (ARGs) and host–ARG associations—along a wastewater-to-beach gradient on Ireland’s west coast. Methods We generated 60 shotgun metagenomes (triplicates) from 1-L surface-water samples collected at four sites on six dates in spring and winter 2021: seawater at a raw effluent discharge point (B), seawater from two beaches flanking the discharge (A, C), and an adjacent freshwater stream (F). Quality-filtered reads were taxonomically classified (Kraken2/Bracken) and annotated for ARGs (AMR++) using stringent thresholds. Reads were also screened against a curated panel of clinically relevant ARGs (CARPDM) to distinguish priority signals from background resistomes. Results Host–ARG networks followed a clear spatial gradient (B > F > A/C). A shared core was dominated by Alpha-, Gamma- and Epsilonproteobacteria linked to macrolide–lincosamide–streptogramin (MLS) resistance. Beaches (A, C) additionally showed Actinomycetes and Alpha-/Betaproteobacteria associated with aminoglycoside, elfamycin, tetracycline, fluoroquinolone and rifampin resistance. Site B was dominated by Gammaproteobacteria linked to β -lactam, multi-metal and drug/biocide resistance; site F showed broad drug/biocide resistance and prominent Betaproteobacteria–fluoroquinolone/rifampin links. Clinically relevant ARGs were detected only at B and F, dominated by tetracycline and MLS determinants (tet(O), tet(T), tet(X3–X4), mphE/msrE, erm), with additional OXA-type β -lactamase, sul1/sul2, dfr and qac signals mapping mainly to Enterobacterales and other pathogenic genera, including ESKAPE members. Conclusions AMR was pervasive, but clinically relevant ARGs were confined to effluent and freshwater sites and were not detected at beaches, supporting targeted mitigation and routine surveillance at discharge points and upstream sources.

Presentation Type: Oral

Session Theme: Emerging Innovations in Agri-Environmental Management.

Cover cropping increases nitrogen uptake and reduces nitrate leaching losses following spring barley in five contrasting soils

Daniel Coonan^{1,2}, [ORCID](#), Imelda Casey², [ORCID](#), Bridget Lynch¹, [ORCID](#), Patrick J. Forrester¹, [ORCID](#)

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Abstract:

Nitrate (NO₃⁻) loss from cropping systems to water contributes to water quality challenges. Elevated NO₃⁻ levels in surface water lead to eutrophication and acidification and pose a human health risk in drinking water sources. Nitrate is mobile in the soil, particularly in free draining cropped soils over the autumn, winter and early spring period due to the absence of a vigorous growing crop combined with the downward movement of water through the soil profile. As a result, residual and/or mineralised nitrogen (N) is vulnerable to loss. Establishing a cover crop in the autumn in spring cropping systems has the potential to retain soil N in the cover crop biomass, thereby reducing the potential for NO₃⁻ loss. This potential was tested using three cover treatments applied to spring barley across five well to poorly drained soils in a lysimeter facility at Teagasc, Johnstown Castle, Co. Wexford. The three cover treatments were natural regeneration following surface tillage (NRfST), rye, and a rye-common vetch mix. There was no significant soil by cover treatment interaction for cover crop aboveground biomass yield or biomass N. On average across soils rye and rye-vetch produced 1703 kg ha⁻¹ and 1819 kg ha⁻¹ aboveground biomass, respectively between 24/08/24 and 03/03/25. In comparison, the NRfST produced significantly less aboveground biomass, averaging 377 kg ha⁻¹ across soils. The aboveground biomass N was 33 kg ha⁻¹ in the case of the rye and 39 kg ha⁻¹ in the case of the rye-vetch mix, whereas the NRfST biomass N uptake was 5 kg ha⁻¹ on average across soils. Across soils, the rye and the rye-vetch mix reduced leachate NO₃-N leaching compared to the NRfST. In this study well-established sown cover crops had greater biomass accumulation, N uptake and delivered greater NO₃-N loss mitigation compared to NRfST.

Presentation Type: Poster

Effects of Cereal–Legume Intercropping on Protein and Land-Use Efficiency in a Whole-cropping System.

Robert K. Tambudze¹, Sarah Murnaghan¹, Paul Cottney², Thomas Moloney³, Joseph P. Lynch¹

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Abstract:

Intercropping of cereals and legumes may offer an agri-environmental strategy to improve forage protein supply and land-use efficiency whilst reducing emissions in sustainable silage systems, reducing reliance on imported grains. This study evaluated the effects of cereal species, legume species, and mixture ratio on wholecrop biomass yield and protein output using land equivalent ratio (LER) and protein land equivalent ratio (PLER) as integrative performance indicators. A field experiment was established under temperate conditions on 1 May 2025 at Crossnacreevy, Northern Ireland, to evaluate three spring cereals (barley, oats, and rye) and two grain legumes (peas and beans) grown either as sole crops or in binary intercrops at seed ratios of 75:25 and 50:50 cereal: legume relative to their typical seeding rate in monoculture. The LER quantified land-use efficiency for biomass production on a dry matter basis per ha, while PLER was similarly calculated from protein yield (kg/ha) to assess land-based protein productivity relative to monocultures. There was no significant effect of cereal species or legume species on LER ($P > 0.05$), though a higher legume proportion trended towards a significant effect for increased LER ($P = 0.081$). For protein productivity, intercrops that contained barley had significantly higher PLER ($P < 0.05$) than oats or rye-based mixtures. A higher legume proportion also significantly increased PLER ($P < 0.05$) across all cereal mixtures. Findings suggest that cereal species selection and legume proportion are key determinants of intercropping advantage for protein yield and land efficiency.

Presentation Type: Oral

From Risk to Resource: Evaluating Rainfall Impact and Harvesting Potential for Irish Harvest Operations

Remember Roger Adjei¹, [ORCID](#), Siobhán N. Jordan¹, Réamonn Fealy², [ORCID](#), Joseph P. Lynch¹ [ORCID](#)

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²Teagasc, Rural Economy & Development Programme, Dublin, Ireland

Abstract:

Harvesting of crops and their associated activities depend largely on environmental conditions. Rainfall significantly influences the harvesting period, increasing the risk of crop losses and affecting farm returns. This case study assessed the variability of rainfall impacts on modelled crop harvest operations opportunities (HOO) in Irish tillage and grassland systems in Southeast Ireland. Daily precipitation [mm] data were extracted from the Met Éireann dataset for Oak Park, Carlow, from 1981 to 2014. Indices of HOO were estimated based on consecutive dry days and defined rainfall thresholds to reflect the drying requirements of the crop. A day was considered suitable for inclusion in a harvest operation if the total daily rainfall recorded was either ≤ 1 mm and/or ≤ 2 mm in a sequence of two, three, or four consecutive days, of different durations. The results indicate high annual variability (CV = 27.7–81.8%) in HOO across months and durations. The results suggest a consistent probability of daily HOO suitability between May and August for 2-day field operation durations based on ≤ 1 mm threshold (0.46 -0.49), and 4-day field operation durations (0.25-0.30), reflecting the increased difficulty in scheduling operations of extended duration. October recorded the lowest HOO across all operation durations, resulting in up to a 30% decrease in HOO day availability compared with operations of similar duration from early summer. Increasing the rainfall threshold for an HOO day to ≤ 2 mm increased the probabilities by up 22%. Findings from this study quantify the increased risk of unfavourable harvesting conditions for late-cut grass, maize silage, and some legume grain species. Risk-mitigating technologies, such as early-maturing crop varieties and on-farm decision-support tools, are key to designing resilient cropping systems for the future. Further studies would assess the impact of soil moisture status on harvesting as a risk indicator.

Presentation Type: Oral

Interactive Effects of Arbuscular Mycorrhizal Fungi and Different Levels of Anaerobic Digestate on Phosphorus Uptake Efficiency of Perennial Ryegrass

Ismaeel Abdulsalam¹

¹Munster Technological University

Abstract:

Arbuscular mycorrhizal fungi (AMF) have shown great potential to increase phosphorus uptake in plant systems. However, the efficiency of individual AMF strains in organic soil amendments remains poorly understood, particularly in forage grasses. This study examined the effects of three AMF strains (*Rhizophagus irregularis* Ri, *Funneliformis mosseae* Fm, and *Funneliformis geosporum* Fg) and the combination of all AMF strains on P uptake in perennial ryegrass (*Lolium perenne* L.) under different application rates of biodigestate (100%, 50%, 25% and 0%). A completely randomised, fully factorial pot experiment was conducted using a growing medium consisting of a mixture of peat (Bulrush Irish Moss Peat) and John Innes 1 mineral soil. This medium was chosen to be low in P, allowing the interaction between the P from the digestate and the AMF to be determined. P uptake and biomass accumulation (fresh and dry weights) were determined. Preliminary results indicated that increasing the amount of biodigestate was the most critical factor for enhancing both fresh and dry weights after 11 weeks. The data clearly showed that applications with high digestate consistently achieved the highest fresh and dry weight. Although the medium and low levels of digestate produced a noticeable increase compared to no biofertiliser. It is interesting to note that although various AMF were tested, the high level of digestate was the dominant factor, often overshadowing the specific fungus used. The experiment is; however, ongoing, and subsequent cuts will be taken to determine the impact of AMF and the estimated P uptake. Overall, the results are expected to provide insight into the interactive effects of these AMF strains and organic amendments on ryegrass production, thereby informing sustainable nutrient management practices in Irish grassland systems.

Presentation Type: Oral

Cultivating Sustainable Habits: Education and Innovation for Sustainable Market

Gardening

Marie Taylor¹, [ORCID](#), Yvonne Doyle¹

¹Technological University Shannon

Abstract:

This paper explores how education, practice and applied research can support the development of sustainable and regenerative market gardening practices. The work is undertaken as part of the Erasmus+ AGRETAIN project, a European collaboration focused on embedding regenerative agriculture within higher education and training. The project aims to bridge the gap between research, education and practice by developing learning resources that support market gardeners in adopting environmentally sustainable production systems that are financially viable. The research is motivated by the growing recognition that market gardening can play an important role in building resilient local food systems while contributing to climate action through biodiversity protection and improving soil health. There are, however, challenges including limited access to training, land and policy support. Through the development of accredited learning modules, practical training resources and collaborative networks (market gardening hubs), the project seeks to strengthen the skills and knowledge needed to support sustainable production practices in market gardening. The primary audiences for this work include growers and new entrants to farming, educators and training providers, researchers and policymakers involved in regenerative agriculture and rural development. In this way, the project promotes knowledge exchange and best practice and supports the co-creation of practical solutions. The key outputs include new educational resources, innovative training approaches, market gardening map and the development of market gardening hubs. In relation to the conference theme, the project highlights how changes in farming habits—through improved skills, education—can support the protection and regeneration of agricultural habitats. These approaches can inform future training initiatives, policy development for this sector.

Presentation Type: Oral

Life Cycle Sustainability of Gluten-Free Food Systems: A Systematic Review of Evidence Gaps and Nutritional Functional Unit Integration

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¹University College Dublin, School of Biosystems and Food Engineering, Dublin, Ireland

²University College Dublin, School of Sociology, Dublin, Ireland

Abstract:

Gluten-free foods are critical for managing coeliac disease; however, the evidence on the sustainability of GF product systems is fragmented and methodologically inconsistent. This protocol-driven systematic literature review (SLR) examines (i) the application of Life Cycle Sustainability Assessment (LCSA) to gluten-free (GF) food systems, (ii) the use of nutritional Life Cycle Assessment (nLCA) or nutrition-linked functional unit approaches, (iii) the reported environmental, nutritional, economic and social trade-offs, and (iv) the methodological challenges that limit synthesis. A structured search of major bibliographic databases for English-language studies published between 2009 and March 2025 yielded 14,723 records, of which 553 were assessed for eligibility. Only six studies met the inclusion criteria, highlighting a significant evidence gap and limited methodological convergence in GF LCSA. The reviewed studies include gluten-free bakery products and cereal or legume-based products, with most employing cradle-to-gate or cradle-to-grave environmental life cycle assessment (LCA). Although this review is framed by LCSA, the evidence is largely environmental. Economic (Life Cycle Costing, LCC) and social (Social Life Cycle Assessment, S-LCA) aspects are minimally addressed or discussed narratively, limiting systematic analysis across sustainability pillars. Nutritional integration is inconsistent, as most studies rely on mass-based functional units rather than nutrient-linked methodologies. Scenario and sensitivity analyses indicate that ingredient reformulation, local sourcing, or changes in waste management can improve climate outcomes. However, such interventions may shift environmental burdens to freshwater eutrophication, climate change, or ozone depletion, and multi-dimensional trade-offs are rarely quantified. Cross-study comparability is restricted by heterogeneous system boundaries, incomplete background database specification, and limited uncertainty reporting. Current sustainability claims for GF food systems rely on a small and heterogeneous evidence base. Advancing credible LCSA requires harmonised nutrition-relevant functional-unit reporting, transparent inventory and LCIA disclosure, and the systematic integration of environmental, economic, and social indicators to support decision-making for healthier, more sustainable GF food systems.

Presentation Type: Poster with 5 min oral presentation

A Comparative Analysis of the Compositional Profiles of Commonly Used Species in Multi-Species Swards and Their Role in Enhancing the Sustainability of Pasture-Based Farming Systems

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¹Dundalk Institute of Technology

Abstract

Limited research characterising the nutritional and secondary metabolite profiles of individual species used in multi-species swards (MSS) has constrained the understanding of species-specific functional roles. This limitation has restricted the development of evidence-based pasture design for MSS to improve animal health and sustainability outcomes. This study aimed to comparatively analyse the physicochemical, nutritional, and secondary metabolite profiles of five commonly used MSS species – perennial ryegrass (*Lolium perenne*), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), plantain (*Plantago lanceolata*), and chicory (*Cichorium intybus*) to identify species-specific traits that may contribute to enhanced forage quality and animal health outcomes. Monocultures were grown under standardised conditions at Teagasc Grange Beef Research Centre, Co. Meath, Ireland, received 20kg of N/ha as protected urea, and were wilted for 24 hours post-harvest. Moisture, pH, ash, total soluble solids, protein, peptides, fat, carbohydrates, minerals, trace elements, total phenols, flavonoids, and antioxidant activity were quantified using a range of spectrophotometric and chromatographic techniques. Significant differences between species were observed ($P < 0.05$). RC displayed the highest crude protein ($18.27\% \pm 0.51$), followed by WC ($18.25\% \pm 0.23$). Although lowest in crude protein ($8.35\% \pm 0.90$), PRG ranked second in peptide content ($63.53\text{g Leu-Gly equivalents/kg} \pm 2.91$) and exhibited the greatest antioxidant activity, with the lowest IC50 ($15.54\text{g/kg} \pm 0.39$). Plantain contained the highest concentrations of total phenols ($15.35\text{g chlorogenic acid equivalents/kg} \pm 1.38$) and flavonoids ($6.91\text{g catechin equivalents/kg} \pm 0.62$). Chicory demonstrated a diverse mineral profile, with elevated levels of magnesium ($4875.75\text{mg/kg} \pm 359.00$), copper ($11.17\text{mg/kg} \pm 2.15$), and zinc ($41.14\text{mg/kg} \pm 2.78$). These compositional differences highlight unique functional roles individual species may play in animal health, forage quality, and sustainability.

Presentation Type: Poster

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