A Low-cost Material for the Adsorption of Antibiotics

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Environ 2024

34th Irish Environmental Researchers Colloquium

"Harvest to Harbour: Research from Soil to Sea"

25th – 27h March 2024

SETU Waterford

SETU Ollscoil Teicneolaíochta an Oirdheiscirt
South East Technological University

esai Environmental Sciences Association of Ireland

Tour the campus

Subject Area	Building	Map Location
Sport & Exercise Science	Tourism & Leisure Building	A
Law & Criminal Justice	Tourism & Leisure Building	A
Arts, Psychology, Languages & Social Science	Tourism & Leisure Building	A
Art, Design & Music	Tourism & Leisure Building	A
Early Childhood Education & Social Care	Tourism & Leisure Building	A
Tourism & Hospitality	Tourism & Leisure Building	A
Part-time & Springboard	Main Building	B
Lab & Land Sciences	Main Building	B
Engineering	Main Building	B
Business	Business School Building	D
Student Supports & Accommodation	Business School Building	D
Clubs & Societies	Business School Building	D
Computing	Walton IT Building	E
Nursing, Health Care & Health Promotion	O'Connell Bianconi Nursing Education Building	F

Cork Road Campus, Waterford

- A Tourism and Leisure Building
- B Main Building
- C Luke Wadding Library
- D Business Block
- E Walton IT Building
- F O'Connell Bianconi Nursing Education Building
- 1 The Viking Food Hall
- 2 Engineering Block
- 3 Engineering Block
- 4 Science Block
- 5 Clubs & Societies
- 6 Exhibition Hall
- 7 SETUSU Social
- 8 Student Life and Learning
- 9 SETU Card Office
- 10 FTG Building
- 11 Disability Office
- 12 Campus Accommodation
- 13 Applied Technology Building

setu.ie

Tour Guide

A Tourism and Leisure Building

This state-of-the-art building is home to Languages, Tourism & Hospitality and Sports & Exercise Science departments. It's fully equipped with modern teaching kitchens, fine dining restaurant, training bar, Human Performance Lab and a small gym. The building houses the Office of the President along with the main reception, Finance, HR and Strategy.

B Main Building

The Registrar's office, international office, careers centre and part time office are on the ground floor as well as the Centra restaurant, a Centra and a Frank & Honest barista bar. On the first floor is the Built Environment, Engineering Technology, Science labs and offices and the Technology Gateway research centre PMBRC.

Luke Wadding Library

C

The library is one of the most modern in higher education and provides learning support programmes for our students and staff. It seats over 2,000 students, has 180,000 print items, 120,000 e-books and 340 periodic journals. During term time, the library has late opening hours to allow students to use its facilities after and between lectures.

Business School Building

D

This is home for the School of Business including its student facilities and research centres. In addition, some of our biggest lecture halls are located on the ground floor along with the Student Life & Learning Offices. Two new state-of-the-art labs for business students (Digital Marketing, and Finance and BIS), and some labs for computing students are located on the first floor.

E Walton IT Building

This building was named after Ernest TS Walton and opened in 2003. Students studying on courses in the Dept of Computing & Mathematics will spend most of their time here. The impressive building holds 16 large computer labs including recently updated Mac labs. Computer Services and the Research Support Unit are also located in this building.

F O'Connell Bianconi Nursing Education Building

Our nursing building is home to students and staff on general, psychiatric, intellectual disability nursing programmes and applied health care and health promotion courses. The offices of the majority of SETU Waterford's School of Health Science lecturers are located here.

The Viking Food Hall

1

The Viking Food Hall is the largest restaurant on campus and is spread over two floors. This 320 seater restaurant is fresh fun & bursting with flavour with an array of fresh foods on offer daily. The restaurant offers staff and students different menus and options with fresh specials on a daily basis.

SETUSU Social

7

The offices of SETU Waterford's Students' Union are located here. The Students' Union team are current or past students voted for by students to represent the students. SETUSU Social provides printing and binding facilities and acts as an area where students can go between class times to chat, relax or play video games.

10 FTG Building

The FTG building is a home to our Arts and Psychology students, and many of the staff offices for these courses are based here, including a small Humanities school office, a psychology lab and dissertation room. The Moodle office, the Maths learning centre and Calmast are also located in this building.

12 Campus Accommodation

College campus is our most popular college accommodation consisting of 69 single ensuite rooms, 3 of which have wheelchair access. It includes Wi-Fi, residents parking, laundry facility, 24-hour security, CCTV and a live-in warden. Our second, larger accommodation is closer to the city centre called City Campus. www.setu.ie/accommodation

Applied Technology Building

13

The Applied Technology Building is located just beside the Cork Road campus, in the industrial estate. The AT building is home to SEAM, one of SETU Waterford's Technology Gateway research centre as well as some postgraduate business offices and our trades students who study plumbing, motor mechanic, electrical engineering. The building also has a small canteen.

SETU
Ollscoil Teicneolaíochta an Oirdheiscirt
South East Technological University

Contents

South East Technological University Waterford

Welcome to ENVIRON 2024 Delegates

Environmental Sciences Association of Ireland (ESAI)
Welcome to ENVIRON 2024 Delegates

Dear Delegates,

On behalf of the ESAI Council, we wish to extend a warm welcome to all delegates to our 34th Irish Environmental Researchers Colloquium (Environ 2024). This year the ESAI are collaborating with the South-East Technological University (SETU) to host the event in their impressive campus in Waterford. 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 Waterford to focus on the theme of this year's Environ, "Harvest to Harbour: Research from Soil to Sea". 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 2024 will commence on the afternoon of Monday 25th March with a series of interactive workshops and field trips, including a choice of two guided field trips to either Anne Valley Park (one of my favourite places) or Copper Coast Geopark (with many impressive geological features). A public event will take place on Monday evening focusing on "How to Run Business Sustainably". The evening will commence with a reception at 7pm followed by a panel discussion at 8pm. The panel include Mailo Power (Monkey Reusable Products Ltd.), Enda Buckley (Carbery Group), Ben Dallaghan (Bord Iascaigh Mhara), Mark Stafford (Danone), Kieran Ryan (MSD Ireland) and Tess Ames (Ocular Therapeutics Research Group). All are welcome to engage in 'How to Run Business Sustainably'.

Environ will then formally open on Tuesday 26th March with an opening address by Prof. Veronica Campbell, President of SETU, Dr. Peter McLoughlin, Head of School of Science & Computing, Dr. Shiau Pin Tan (Graece) SETU Conference Convenor and ESAI Chairperson, Dr. Niamh Power. Grace O'Sullivan, Green Party MEP will deliver the plenary lecture on Tuesday, entitled "Milestones of this Mandate". The second plenary session "Bridging the gap, connecting EPA research with policy" will be delivered by Dr. Tara Higgins, Programme Manager of EPA's Evidence Programme. On Wednesday, 27th March we will have our third plenary lecturer by Tasneem Khan, Founder of Sea School, Dunmore East, on "Connecting Marine & Maritime Knowledge".

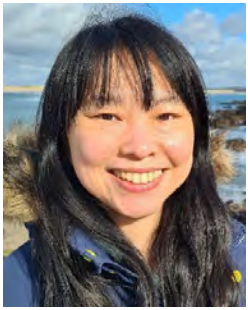
Several interactive events will take place over the two days, including a variety of oral and poster presentations, plenary speakers and social evenings. The ESAI are delighted to announce that this year we have over €2,750 in prizes generously donated by our sponsors. These will acknowledge scientific excellence across a range of disciplines including a prize for best overall poster and oral presentation. Environ 2024 will culminate on the afternoon of Wednesday 27th April with the prizegiving ceremony.

The ESAI wishes to sincerely thank Environ 2024 conference co-convenor Dr. Shiau Pin Tan (Graece) and all their team at SETU Waterford Campus 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
ENVIRON 2024 Colloquium Co-Convenors,
www.esaiweb.org

Welcome to ENVIRON 2024 Delegates



South East Technological University Organising Committee
Welcome to ENVIRON 2024 Delegates

Dear Delegates,

On behalf of the Organising committee at South East Technological University, we extend our warmest welcome to each of you as you embark on a journey towards a more sustainable and resilient future at Environ 2024. The 34th Irish Environmental Researchers Colloquium (Environ 2024), is a collaboration between the Environmental Sciences Association of Ireland (ESAI) and South East Technological University (SETU) Waterford. Environ is the longest running and largest forum for environmental researchers in Ireland, attracting an average of 270 delegates annually. The event offers a high-visibility platform for both young and experienced researchers to present their findings to an audience comprised of academia, government bodies and agencies, as well as industry representatives.

This year's Environ 2024 theme is "Harbour to Harvest: Research from Soil to Sea" echoing most of the 17 UN Sustainable Development Goals such as 'Good Health & Well Being', 'Clean Water & Sanitation', 'Affordable & Clean Energy', 'Decent Work & Economic Growth', 'Industry, Innovation & Infrastructure', 'Sustainable cities & Communities', 'Responsible consumption & Production', 'Climate Action', 'Life Below Water', 'Life on Land' etc. ENVIRON 2024 should reflect how research in different areas could collaborate to create solutions for a healthy and sustainable nature and environment for the wellbeing of all the living organisms in this world.

Over the next 3 days, we will come together to explore innovative solutions, share insights and foster collaboration that transcends borders and disciplines. This conference is not just a meeting of minds; it is a convergence of passionate individuals dedicated to forging a path towards a greener and more harmonious world.

The conference will commence on Monday, 25th March 2024, with two guided field trips to Anne Valley Park and Copper Coast Geopark. Anne Valley Park tour will be guided by Mike Walsh, a lecturer in the Department of Science & Land Science at SETU Waterford, involved in biodiversity & environmental research and part of the committee responsible for the creation of the Anne Valley Nature Walk, officially opened in 2013. The committee won the Mayor's Award at the Waterford Public Participation Network (PPN) Community & Voluntary Awards in November 2019 for their work on this project.

In the afternoon, we will run an interactive Greener Lab workshop, a two-hour interactive session aimed at any lab users to provoke thought about the 'way things have always been done' in lab and look at how we can reduce environmental impact of lab practices without impacting the quality of research. We will be joined by a panel of special guests with a wealth of experience in this space, including Dr. Jane Kilcoyne (Marine Institute), Jack O'Grady (Senior Program Manager My Green Lab), Dr. Una Fitzgerald (Director of Galway Neuroscience & Founder of Galway Green Lab) and will be chaired by Dr. Niall O'Reilly (Manager of PMBRC, SETU).

On Monday evening, a wine reception, environmental photography exhibition, and public engagement panel discussion on "How to Run your Business Sustainably" will be hosted at the SETU Waterford campus. This event will include guest speakers from the various industries such as Food (Mark Stafford, Danone), Agriculture (Enda Buckley, Carbery Group), Marine (Ben Dallaghan, BIM), Pharmaceutical (Kieran Ryan, MSD) and Consumer Products (Mailo Power, Monkey Reusable Products Ltd) to discuss sustainable practices in their businesses for a healthy environment.

The second day of the conference, Tuesday, 26th March, will begin with a welcome address and opening speeches from the President of SETU, Prof. Veronica Campbell, Prof. Peter McLoughlin, Head of School of Science and Computing, SETU, Dr Graece Tan (SETU Conference Convenor) & ESAI Chairperson, Dr Niamh Power. This will be followed by a keynote talk from Grace O'Sullivan, Green Party MP, Member of the European Parliament and member of the European Green Party, entitled "Milestones of this Mandate'" and a talk by Dr. Tara Higgins, Program Manager of EPA's Evidence Programme entitled "Bridging the Gap", connecting EPA research with policy. Afterward, there will be oral parallel sessions throughout the day featuring talks from various keynote chairpersons, a dynamic mix of presentations from environmental researchers and including 5 minute short presentations from early-stage researchers. Dedicated networking poster sessions will feature throughout the day. The second day will conclude with the Gala Dinner at the Tower Hotel in Waterford City, followed by music and dancing.

The last day of the conference, Wednesday 27th March 2024 will commence with a talk by Tasneem Khan, the founder of SEA School in Dunmore East, Waterford, entitled "On SEAing: Connecting Marine & Maritime Knowledge", followed by oral parallel sessions and a dedicated networking poster session. The conference will conclude with a student award ceremony recognising 'Best In Conference'.

We encourage you to engage wholeheartedly, share your experience and embrace the opportunity to learn from one another. Your active participation is key to the success of Environ 2024, and we are confident that your contribution will help shape the conversations that will define our shared environmental future.

Once again, welcome to Environ 2024, and may these days be filled with inspiration, collaboration and a renewed sense of purpose as we work together towards a more sustainable and resilient world. We also hope that as many as possible can attend the social events or if time permits enjoy Ireland's oldest city, Waterford.

Shiau Pin Tan (Graece)
ENVIRON 2024 Colloquium Co-Convenors,
On behalf of the ENVIRON2024 Organising Committees

Environ 2024 Organising Committee

Chair	Dr. Shiau Pin Tan (Graece) South East Technological University, Waterford	
SETU Organizing Committee	Cara Daly Claire Keary Helen Hughes Orla Watters Tracey Coady	
ESAI Organizing Committee	Sara Meehan Niamh Power ESAI Council	
SETU Event Team	Abinash Nayak Angus Collison Andrew Harrington Brakemi Egbedi Caroline Botha Dileep Kumar Evelyn Landers Eleanor Owens Emma Hart Fatima Zahra Shane Scannel	Jenna Lee Joseph Anim Boadu Mike Kinsella Maria Luz Prieto Melissa Taylor Rebecca Synnott Rozina Samuel Browett Syeda Attiqa Tajammal Daniel McLoughlin

Special thanks to everyone in the following departments for their help:
SETU Estate Department, SETU School of Science office, SETU Educational Service Technical Unit, Porters Office, SETU Novus Team and SETU Computer Services

Thanks to the Environ 2024 Conference Sponsors and Exhibitors

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Republic of Ireland Branch

ENVIRONMENTAL SERVICES
IRELAND

CIEEM Chartered Institute of Ecology and Environmental Management

Environ 2024

AN APPROVED EVENT FOR CONTINOUS PROFESSIONAL DEVELOPMENT

ENGINEERS IRELAND

CPD APPROVED EVENT 2024

CIWM

Endorsed 2024

Environ 2024

South East Technological University Waterford

25th - 27th March 2024

34th Irish Environmental Researchers Colloquium

**"Harvest to Harbour:
Research from Soil to Sea"**

INFORMATION FOR DELEGATES

Registration

The Colloquium Registration Desk will be on the ground floor of the main building (B), at the entrance of the building (in front of Centra).

The registration desk will be open at the following times;

Monday 25th March	10:00 – 17:00 & 18:30 – 20:00
Tuesday 26th March	08:30 – 17:15
Wednesday 27th March	09:00 – 12:00

Delegate Badges

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

Environ Assistants/Event Teams

There will be Environ Assistants in all rooms 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 when needed.

Walking Tours

There are two walking tours available: the Anne Valley Walking Tour and the Copper Coast Walking Tour on Monday, 25th March from 10.15 am – 2.15pm. The tours will consist of a leisurely walk lasting 2 hours, so participants are expected to have reasonable level of fitness. Delegates are advised to wear comfortable shoes and gear suitable for walking (as there will be gravel walking path), bring plenty of drinking water (and snacks for those who like to graze), and to wear appropriate attire to cater for potential sunny and rainy conditions. Ireland, being known for experiencing unpredictable weather, makes this preparation essential.

Bag Drop

There will be a dedicated room (Room A02) for bags, but please contact the porters (porter's office is next to the main Auditorium) to gain access to the room. Opening times for the bag drops is from 8.30am – 5.15pm. Please ensure the bags are collected no later than 5.15pm in the evening every day.

Emergency Contact Numbers

Medical Emergencies

SETU Waterford Medical Centre	:	051-302873
SETU Nurse	:	051-302863, 051-845671
CareDoc	:	0818 300 365, 059 913 8100
Waterford Regional Hospital	:	051-848000
Emergency services	:	999 or 112
Dialling from SETU landline	:	(9)-999 or (9)-112

All non-medical Emergencies

Building porters	:	051-302674, 087-1972207
Security office	:	087-9400888
Garda Siochana	:	051-305300

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. (Please see the SETU Campus Map overleaf under car parking for assembly points.)

SETU is fully committed to establishing a healthy environment by eliminating exposure to environmental tobacco and e-cigarette smoke and vapour. Therefore:

- Smoking is prohibited inside all buildings and in all SETU owned and/or leased vehicles
- Smoking and vaping are prohibited directly outside all building entrances and exits
- The use of electronic cigarettes (e-cigarettes and vapes) is prohibited inside all buildings and in all SETU owned and/or leased vehicles.

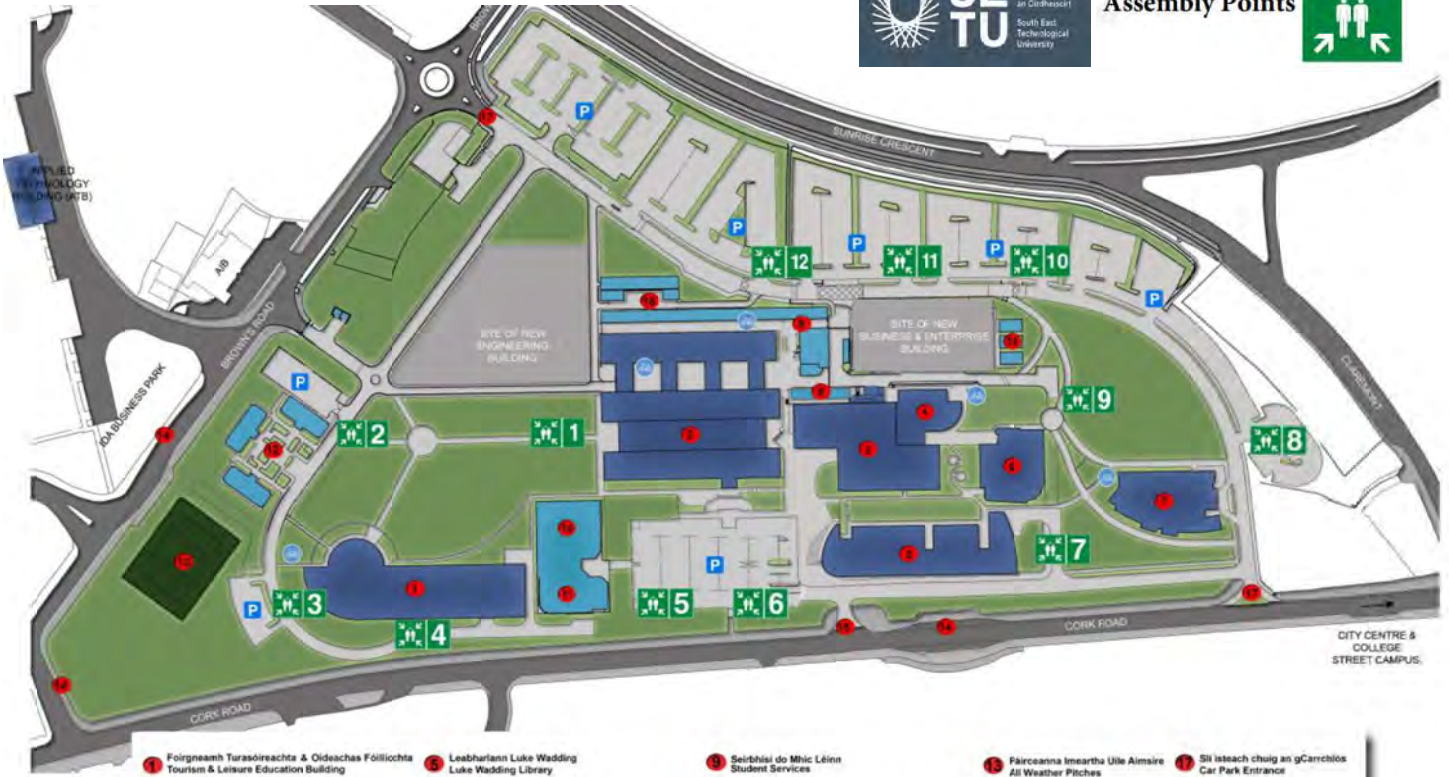
Access to SETU Waterford Main Campus

WAccess to SETU Waterford Main campus is via Cork Road entrance.

As we are aiming for a Low Carbon conference, we strongly encourage all participants to come to SETU Waterford by public transport, cycling (12 min from Waterford City), walking (40 min from Waterford City) or carpooling.

Travel to the Conference from Waterford City by Public Transport is strongly encouraged (Bus W1, W2, 360, 360a). SETU Waterford also have TFI bike stations in 3 locations within the Main Campus in Cork Road. Delegates driving to the conference can park in the carpark for free (front and side car park).

Assembly Points



1. Foirgneamh Turasóireachta & Oideachas Fóilliochta Tourism & Leisure Education Building
2. Foirgneamh Innealtóireachta & Eolaíochta Engineering & Sciences Building
3. Foirgnimh na Scoile Gnó Business School Building
4. Bialann an Ghailearaí Gallery Restaurant
5. Leabharlann Luke Wadding Luke Wadding Library
6. Foirgneamh I.T. Walton Walton I.T. Building
7. Foirgneamh Uí Chonaill-Bianconi (Sláinte Eolaíocht) O'Connell Bianconi (Health Sciences) Building
8. Sláinte & Ionad Leighis Health & Medical Centre
9. Seirbhísí do Mhic Léinn Student Services
10. Halla IlChuspóra Multi-Purpose Hall
11. An Cruinneachán-Lárionad Sóisíalta do Mhic Léinn Dome Student Social Centre
12. Árasáin Mhac Léinn Páirceanna an Choláiste College Fields Student Apartments
13. Páirceanna Imeartha Uile Aimsire All Weather Pitches
14. Stad bus Bus Stop
15. Sli isteach Príomhleathanach Main Entrance
16. Oifigí Foirne Staff Offices
17. Sli isteach chuig an gCarrchlós Car Park Entrance
18. Foirgneamh Cothabhála Maintenance Building
- Carrchlósanna Car Parks
- Clósanna Rothaí Bicycle Parks

Registration	**Monday 25th March** 10:00 – 17:00 & 18:30 – 20:00 **Tuesday 26th March** 08:30 – 17:15 **Wednesday 27th March** 09:00 – 12:00 Ground Floor Main Building (Building B)
Walking Tour (Anne Valley & Copper Coast) Departure	**Monday 25th March** Main Campus Front Car Park, SETU Waterford Meet at the registration desk at 10:00, event team will escort delegates to the bus
Greener Lab workshop	**Monday 25th March** 15:00 – 17:00 Tourism & Leisure Building, Season's Restaurant, SETU Waterford (Building A) Tea & Coffee will be in the same room
Public Event drinks reception, environmental photography, panel discussion and Q&A	**Monday 25th March 19:15-21:30** Atrium & Main Auditorium (Building B)
Plenary Sessions	**Tuesday 26th March** 09:15 – 10:45 Main Auditorium (Building B) **Wednesday 27th March** 09:30 – 10:00 Main Auditorium (Building B)
Poster Sessions	**Tuesday 26th & Wednesday 27th March** Atrium (Building B)
Parallel Sessions	**Tuesday 26th & Wednesday 27th March** Room F01 (Tramore Room), Room F02 (Dunmore Room), Room F03 (Ardmore Room) & Room F04 (Lismore Room) in Business Building (Building D)
Tea/Coffee Sessions	**Tuesday 26th & Wednesday 27th March** Atrium (Building B)
Exhibitors	**Tuesday 26th & Wednesday 27th March** Atrium (Building B)
Lunch	**Tuesday 26th & Wednesday 27th March** Viking Food Hall (on your right as you move towards 'Building 1' from Business building)
Conference Gala Dinner	**Tuesday 26th March** 19:00 – 24:00 Tower Hotel Ardmore Suite, Waterford
ESAI Early Careers Network (ECN) meeting	**Tuesday 26th March** Main Auditorium (Building B)
ESAI AGM	**Tuesday 26th March** 17:15 – 18:00 Main Auditorium (Building B)
Prize Giving Ceremony	**Wednesday 27th March** 13:45 – 14:30 Main Auditorium (Building B)

Delegates giving oral presentations

After registering for the colloquium, delegates giving oral presentations should upload their presentations via the ExOrdo system before 22nd March 2024. All presentations for oral sessions should be uploaded well in advance of the session in which the presentation is being given. Presentation titles should start with the submission of the author's surname for easy identification. Presenters are asked to introduce themselves to the session chairs in the assigned session room at least 10 minutes before the session begins.

Delegates presenting posters

The poster presentation area is located in the atrium. When you arrive 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 25th March (10:00- 17:00) or on Tuesday morning (08:15-10:00). The first poster session is at 10:45 on Tuesday 26th March. Please do not remove your poster until the end of the poster session at 14:45 on Wednesday 27th March. 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 (check your poster ID number in poster abstract section). Your poster must be mounted on the poster board assigned to your ID.

Wifi Access

Eduroam - Visitors who are registered in an eduroam-enabled institution, and have their devices configured correctly prior to their visit to the University do not require another account.

If you do not have Eduroam then you can request **Guest access** to the SETU wireless network by following the steps below to create an Eduroam account.

Step 1: Click on the wireless icon to reveal networks and click on "**Eduroam**"

In the **EAP Method** select **PEAP** option

In the **Phase 2 Authentication** select **MSCHAPV2** option

In the **CA 2 Certificate** step, select the **Do not Validate** option

In the **Identity** box, enter your SETU Waterford Username **scivisit@wit.ie**

Leave the Anonymous Identity box blank

Step 2: Password will be provided at the registration desk.

Social Media

Please use **#Environ2024**, **@setuIreland**, **@SETU** and **@Esai_Environ** for your social media posts during and after the event if you post event material.

ATM

The ATM is located in AIB bank which is opposite the campus, exit from the side door (towards Tourism and Leisure building, Building A).

Parking

Delegates can utilise the two car parks (labelled P in blue) within the campus ground.

Hydration Stations

Hydration stations are located outside the main auditorium and the parallel rooms (outside F07), please bring a refillable bottle for water.

As we are reducing waste generation, please bring your own keep cups if you wish to takeaway coffees/teas. There is also a cup washing station outside Centra at the main entrance.

Conference Dinner

The conference dinner will be hosted in the Tower Hotel, Waterford:
Address: The Mall, The Viking Triangle, Waterford, Ireland X91VXEO
Phone: +353 (0) 51 862300
Eircode: View on map

Useful Taxi numbers

Rapid Cabs	+353 (0) 51 858 585
Liga Taxi Waterford	+353 (0) 89 414 3234

Environ 2024 - 34th Irish Environmental Researchers Colloquium 25 - 27 Mar 2024 *All times in GST*

Monday, 25 March

10am

Registration (Upload presentations and display poster)

10:15am

Field Trips (Anne Valley Park Guided Walk & Copper Coast Geopark Guided Tour)
Main Campus Carpark, SETU, Waterford

3pm

Greener Lab Workshop & Discussion
Tourism & Leisure Building, Seasons Restaurant, SETU Waterford

7pm

Public Engagement Panel Discussion & Q&A session: How to Run Business Sustainably
Main Auditorium, SETU, Waterford

Tuesday, 26 March

8:15am

Registration (Upload presentations and display poster)
Main Entrance, SETU, Waterford

9:15am

Environ 2024 opening session
Main Auditorium, SETU, Waterford

9:45am

Plenary Lecture 1
Main Auditorium, SETU, Waterford

10:15am

Plenary Lecture 2
Main Auditorium, SETU, Waterford

10:45am

Networking, Poster Session & Meet the Exhibitors
Atrium, Outside Auditorium, SETU, Waterford

11:30am

Climate Policy & Communications
Room FO1, Tramore Lecture Room, SETU, Waterford

Sustainable Green Building & Future Proofing Our Forest
Room F02, Dunmore Lecture Room, SETU, Waterford

Sustainable Energy Development
Room F03, Ardmore Lecture Room, SETU, Waterford

Sustainable & Regenerative Agriculture
Room F04, Lismore Lecture Room, SETU, Waterford

1pm

Lunch
Viking Food Hall, SETU, Waterford

1:30pm

ESAI Early Careers Network (ECN) meeting
Main Auditorium, SETU, Waterford

2pm

Waste Management & Circular Economy
Room FO1, Tramore Lecture Room, SETU, Waterford

Environmental Monitoring
Room F02, Dunmore Lecture Room, SETU, Waterford

Sustainable Energy Development
Room F03, Ardmore Lecture Room, SETU, Waterford

Sustainable & Regenerative Agriculture & Soil Health & Use
Room F04, Lismore Lecture Room, SETU, Waterford

3:30pm

Networking, Poster Session & Meet the Exhibitors
Atrium, Outside Auditorium, SETU, Waterford

4:15pm

Planning for Climate Change
Room FO1, Tramore Lecture Room, SETU, Waterford

Environmental Monitoring
Room F02, Dunmore Lecture Room, SETU, Waterford

Incorporating Sustainability into Curriculum
Room F03, Ardmore Lecture Room, SETU, Waterford

Land & Sea Carbon Capture & Maximising Marine & Coastal Resources
Room F04, Lismore Lecture Room, SETU, Waterford

5:15pm

ESAI AGM Featuring presentation from ESAI Postgraduate of the Year 2023 Winners
Main Auditorium, SETU, Waterford

7pm

Conference Gala Dinner, followed by live music & dancing
Tower Hotel, Waterford City

Wednesday, 27 March

9am

Registration
Main Entrance, SETU, Waterford

9:30am

Plenary Lecture 3
Main Auditorium, SETU, Waterford

Powered by Ex Ordo, everything you need to run a research conference..

Environ 2024 - 34th Irish Environmental Researchers Colloquium 25 - 27 Mar 2024 *All times in GST*

Continued from **Wednesday, 27 March**

10am

Biodiversity & Ecosystem
Room FO1, Tramore Lecture Room, SETU, Waterford

Environmental Monitoring
Room F02, Dunmore Lecture Room, SETU, Waterford

Incorporating Sustainability into Curriculum
Room F03, Ardmore Lecture Room, SETU, Waterford

Water Quality & Health
Room F04, Lismore Lecture Room, SETU, Waterford

11am

Networking, Poster Session & Meet the Exhibitors
Atrium, Outside Auditorium, SETU, Waterford

11:45am

Biodiversity & Ecosystem
Room FO1, Tramore Lecture Room, SETU, Waterford

Wastewater Treatment & Management
Room F02, Dunmore Lecture Room, SETU, Waterford

Green Chemistry for Sustainable Development
Room F03, Ardmore Lecture Room, SETU, Waterford

Water Quality & Health
Room F04, Lismore Lecture Room, SETU, Waterford

12:45pm

Lunch
Viking Food Hall, SETU, Waterford

1:45pm

Student Prize Giving Ceremony 'Best in Conference' & Close of Environ 2024
Main Auditorium, SETU, Waterford

2:30pm

Planning for Climate Change Posters
Atrium, Outside Auditorium, SETU, Waterford

Environmental Monitoring Posters
Atrium, Outside Auditorium, SETU, Waterford

Climate Policy & Communication Posters
Atrium, Outside Auditorium, SETU, Waterford

Biodiversity & Ecosystems posters
Atrium, Outside Auditorium, SETU, Waterford

Sustainable & Regenerative Agriculture Posters
Atrium, Outside Auditorium, SETU, Waterford

Soil Health & Use Posters
Atrium, Outside Auditorium, SETU, Waterford

Sustainable Energy Development Posters
Atrium, Outside Auditorium, SETU, Waterford

Waste Management & Circular Economy Posters
Atrium, Outside Auditorium, SETU, Waterford

Wastewater Treatment & Management Posters
Atrium, Outside Auditorium, SETU, Waterford

Green Chemistry for Sustainable Development Posters
Atrium, Outside Auditorium, SETU, Waterford

Incorporating Sustainability in Curriculum Posters
Atrium, Outside Auditorium, SETU, Waterford

Land & Sea Carbon Capture Posters
Atrium, Outside Auditorium, SETU, Waterford

Future Proofing our Forest Posters
Atrium, Outside Auditorium, SETU, Waterford

Water Quality & Health Posters
Atrium, Outside Auditorium, SETU, Waterford

Powered by Ex Ordo, everything you need to run a research conference..

Environ 2024

South East Technological University Waterford

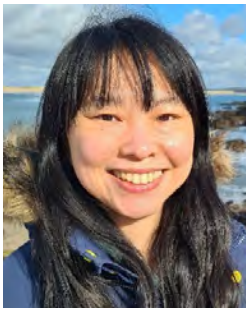
25th - 27th March 2024

34th Irish Environmental Researchers Colloquium

**"Harvest to Harbour:
Research from Soil to Sea"**

BIOGRAPHIES

SETU Waterford Co-Convenor



Dr Graece Tan

Dr. Graece is a lecturer in Biopharmaceutical Science at SETU Waterford. She holds a PhD focusing on utilising antimicrobials from seaweed in wound dressing applications. She has successfully obtained commercialisation funding to follow up her PhD project and has numerous peer-reviewed publications in the field of natural product extractions and identification, and their potential use in high-value added applications. Her main interest lies in mining bioactives from natural sources and waste materials for various applications, including biopesticides and then use in medical devices. She is currently supervising a number of PhD students in natural product research at SETU Waterford.

Workshop at Environ: Guided Anne Valley Walk

Monday 25th March 2024

Speaker

Mike Walsh, Lecturer, SETU Waterford

Mike Walsh is a Lecturer in the Department of Science & Land Science at SETU Waterford. Mike is part of the Committee responsible for the creation of the Anne Valley walk which was officially opened in 2013. The Committee won the Mayor's Award at the Waterford Public Participation Network (PPN) Community & Voluntary Awards in Nov 2019 for their work on this project.

Workshop at Environ: Greener Lab

Monday 25th March 2024

Speaker

Prof Una Fitzgerald

Senior Lecturer, My Green Lab

Prof Una Fitzgerald is a Senior Lecturer in Biomedical Engineering whose primary research focus is Multiple Sclerosis. However, over the last six years, she has developed an interest and expertise in the area of lab sustainability. In 2019 she led the CÚRAM lab to be the first in Europe to gain Green Lab Certification from My Green Lab (see https://www.youtube.com/watch?v=9QuQ6XoEMKs). This led to an invitation to chair SEAI's working group for public sector labs and the launch on Earth Day 2022 of Irish Green Labs (see https://irishgreenlabs.org/). During the workshop, Una hopes to encourage and incentivise conference delegates to find their own lab greening climate action and collectively, to scale their impact teaching and research labs!

Speaker

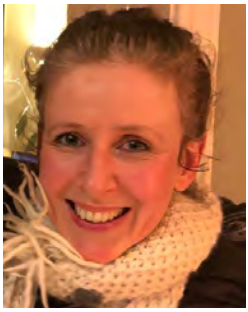
Jack O'Grady

Senior Programmes Manager, My Green Lab

Jack O'Grady is the Senior Programmes Manager at the International Non-Profit Organisation, My Green Lab. He is based out of Limerick, Ireland, from where he supports laboratories globally involved in the My Green Lab Certification Programme. His responsibilities also involve the administrative work and management of both the International Freezer Challenge, My Green Lab Ambassador Programme and supporting lead generation for the business. Furthermore, Jack is a consummate orator, speaking and presenting at both in-person and virtual national and international conferences, including panel and roundtable discussions, emphasising the necessity, importance and benefits of a more sustainable scientific industry. Jack graduated from Munster Technological University in 2019 with a First Class Honours Degree in Nutrition & Health Science. Prior to joining My Green Lab, Jack had previously plied his trade within the laboratories of both PepsiCo and Regeneron. During his time in PepsiCo, Jack spearheaded the project for PepsiCo's pursuit of My Green Lab Certification for a number of laboratories across multiple European PepsiCo sites.

Workshop at Environ: Greener Lab

Monday 25th March 2024



Speaker

Dr Jane Kilcoyne

Analytical Chemist, The Marine Institute

Dr Jane Kilcoyne is an analytical chemist at the Marine Institute in Galway. She works in the Marine Environment and Food Safety Section, specialising in the monitoring and research of marine biotoxins, produced by phytoplankton that can accumulate in shellfish, and are harmful to human health. Jane is an advocate for climate and biodiversity activism, sustainability, and greening laboratories. She is co-chair of the Get Greener team at the Marine Institute and is a member of the Irish Green Labs network. Her recent work highlights how laboratories can reduce environmental impacts by adopting more sustainable procedures and behaviours.

Chairperson

Dr Niall O'Reilly

Manager, PMBRC

Dr Niall O'Reilly is Centre Manger of the Pharmaceutical and Molecular Biotechnology Research Centre (PMBRC) and has over 20 years pharmaceutical R&D experience, six of which has been in industry. Niall has overseen the development of the centre since 2009 including the coordination of projects with over 100 industry partners. Prior to joining the PMBRC, Niall held positions in Élan Drug Delivery (now Alkermes) and Genzyme Ireland Ltd. working in areas such as formulation and process development; analytical method development and validation; stability; clinical manufacture, scale-up and commercialisation. He has experience in the development of tablets, multiparticulates, capsules, powders, softgels, transdermals and injectables. Niall's research interests include controlled release drug delivery, drug product formulation and pharmaceutical analysis. Niall holds a B.Sc. degree in Industrial Chemistry from the University of Limerick and was awarded a Ph.D. from the same institution for his research on protein function in organic solvents.

Public Session and Q&A Discussion: How to Run Your Business Sustainably

Monday 25th March 2024

Chairperson

Ms Tess Ames

Project Manager and Research Group Manager, OTRG, South East Technological University Waterford

Tess Ames has been working at South East Technological University for 4 years as the EU Project Manager for the Horizon Europe ORBITAL ITN, as well as the Group Manager for the Ocular Therapeutics Research Group. She assists in applications for funding opportunities for researchers in the group, including local, national, international and EU Collaborative projects. She brings over 10 years of Project Management and Grant Management experience from both the EU and US, and has worked across both private and public sectors, and her current role covers pre and post- award management, implementation and support.

Public Session and Q&A Discussion — Monday 25th March 2024

Speaker 1

Mr Enda Buckley

Director of Sustainability, Carbery Group

Enda Buckley is Director of Sustainability with the Carbery Group. He has over 18 years' experience in the sustainability scene. Over the past seven years he has spearheaded a number of sustainability initiatives and projects within the Carbery Group such as Farm Zero C, the Carbery trees initiative and the Biorefinery Glas (grass biorefinery) project. These projects and Carbery's wider ESG strategy have enabled the group to become an Origin Green gold member for 3 years and winners of multiple sustainability awards. Prior to his time at Carbery, Enda worked in his own consultancy - Sustainable Solutions, tutored at DCU, worked as the Sustainable Transport Policy Officer for the Irish Environmental Network (IEN) and was Sustainability Director at the National Newspapers of Ireland (NNI). Enda is a science graduate of NUI Galway with a HDip in Applied Science Microbiology and also holds an MSc in the Management of Sustainable Development through Dublin City University (DCU).

Speaker 2

Mr Ben Dallaghan

Project Manager, Bord Iascaigh Mhara

Mr. Ben Dallaghan is a project manager in BIMs economic and strategic services unit and is a co-author of the BIM seafood carbon footprint study. Ben has been working in the seafood sector for over 20 years and holds a master's degree in food, health and nutrition and is in the second year of a PhD with TU Dublin where he is researching the carbon footprint of Irish seafood supply chains.

Public Session and Q&A Discussion — Monday 25th March 2024

Speaker 3

Kieran Ryan

Energy & Sustainability Lead, MSD Ballydine

Kieran Ryan is a manufacturing engineer with over 25 years of experience across different industries. He has worked in manufacturing & medical device facilities and currently works in pharmaceuticals. He has held the role of Energy Lead for over 20 years in various companies. As the MSD Ballydine Sustainability program lead, Kieran is responsible for delivering the site Energy & Sustainability Program which currently includes maintaining ISO50001, delivering Net Zero through the introduction of Heat Pumps, Electric Boilers (DS3), Solar PV Roof, Ground & Solar thermal...etc. He is also responsible for leading the All-Ireland MSD Carbon Transition Work Strand and responsible for leading and providing hands on support for the site Water, Waste & Biodiversity work.

Speaker 4

Prof Malio Power

Managing Director, Monkey Reusable Product Ltd

Mailo Power lives and works in Dunmore East, County Waterford. Mailo's passion is to help turn the tide on single-use disposables, inspiring change by developing a range of colourful and stylish reusable alternatives.

Since launching at Showcase Ireland in 2019 Monkey Cups has become a leading brand in the reusable coffee cup and water bottle market both in retail and corporate sectors, providing custom branded reusable coffee cups and stainless steel bottles to a wide range of corporate clients including Virgin Media, Guinness, Emerald Airlines, AIB and MSD Ireland Group.

Monkey Reusable Products Ltd., is currently developing export markets in Northern Ireland, UK and the Netherlands.

Public Session and Q&A Discussion — Monday 25th March 2024

Speaker 5

Mr Mark Stafford

Nature & Sustainability Manager, Danone Wexford

Mark Stafford is the Nature and Sustainability Manager at Danone Wexford. With over 10 years of experience in the food & beverage industry, he has in depth experience in sustainable practices in the manufacturing industry. His areas of expertise include decarbonisation, energy efficiency, water efficiency, waste reduction and environmental management in manufacturing operations. At Environ 2024, Mark will share insights from Danone's sustainability strategy. He will discuss the challenges they faced, the strategies they employed, and the benefits they have gained from their commitment to sustainability.

Opening Event

Tuesday 26th March 2024

President of South East Technological University

Prof Veronica Campbell

Prof Veronica Campbell is a Pharmacology graduate of the University of Edinburgh and was awarded her PhD from the University of London. In 1998 she moved to Ireland and joined the School of Medicine at Trinity College Dublin. She has held several senior leadership roles in Trinity College, including Dean of Graduate Studies and Bursar & Director of Strategic Innovation; in the latter role from 2015 to 2021 Prof Campbell oversaw the commencement of a major capital project portfolio in the university. Prof Campbell served on the inaugural Board of the Atlantic Institute, based in Oxford University, and was the chair of the Global Brain Health Institute of Trinity College and the University of California San Francisco, funded by Atlantic Philanthropies. She is a former President of the Royal Academy of Medicine in Ireland (Biomedical Sciences Section). Veronica was appointed as inaugural President of South East Technological University in July 2022

Head of School of Science and Computing SETU

Prof Peter McLoughlin

Prof Peter McLoughlin is Head of the School (Dean) of Science and Computing at South East Technological University (Waterford Campus), Principal Investigator in the Pharmaceutical and Molecular Biotechnology Research Centre (PMBRC) and one of the research PIs in the Eco-Innovation Research Centre (EIRC). His main pharmaceutical research interests include the development of minimally invasive drug delivery technologies including microneedles and contact lenses. His research in natural products includes the extraction and formulation of novel bioactive compounds from seaweed. Applications of these bioactives include their use as novel antimicrobials in wound dressings and as bioherbicides. All of his work involves collaboration with international and national partners as well as a number of multinational and indigenous companies. To-date he has supervised 27 Ph.D. students and one Masters student to completion and coordinated research applications resulting in over €30 million in funding to SETU. He also acted as an expert reviewer for a number of peer-reviewed journals and an external examiner for a number of PhD students.

Opening Event

Tuesday 26th March 2024

Environmental Sciences Association of Ireland Chairperson

Dr Niamh Power

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) sustainable use of nutrients these projects including (ReNu2Cycle, ReNu2Farm and Phos4You,) and future resilience of the farming sector (SIMONE) . Dr. Power is also working on the N-TUTORR project as the sustainability lead for MTU and is looking embedding education for sustainable development with higher education.

Plenary Session 1 — Tuesday 26th March 2024

Keynote Speaker

Ms Grace O'Sullivan

Green Party and EU member, *"Milestones of this Mandate"*

Grace O'Sullivan is a mother of three from the beautiful seaside town of Tramore in Co. Waterford, on the South East coast of Ireland; she is an environmental and peace activist, a Green Party MEP, an environmental education specialist and an ecologist and in the past has been involved in a number of sustainable business developments.

Grace has always had a strong affinity with all things marine and worked in her early years as a lifeguard and later as a member of a sea and cliff rescue team in Tramore and proudly holds the title as Ireland's first female surf champion!

At 21 Grace took up a job with Greenpeace, where she spent the next twenty years of her career travelling the seas and oceans of the world, taking part in actions for peace and climate justice and was a crew member of the Rainbow Warrior when it was bombed by the French Foreign Intelligence Service in 1985.

Grace continued her work as a peace and environment activist within the political sphere serving for three years as a Senator in the Irish Parliament and subsequently as MEP after she was elected to the European Parliament in 2019.

Grace is a proactive member of important committees serving on the Maritime Affairs and Fisheries (PECH) Committee, and the Environment, Public Health and Food Safety (ENVI) Committee. Grace is also a member of delegations on Mercosur and Palestine, a member of the Euro-Latin America Parliamentary Assembly and a member of a number of inter-groups and working groups and is the Green Party Spokesperson on the Marine. Grace is also member of the SDGs Alliance in the European Parliament and a member of Parliamentarians for the Global Goals.

Plenary Session 1 — Tuesday 26th March 2024

Keynote Speaker

Dr Tara Higgins

Environmental Protection Agency, *"Bridging The Gap: Connecting EPA Research With Policy"*

Dr Tara Higgins is Programme Manager of the EPA's Evidence Programme, which includes the EPA Research Programme. The EPA has been funding independent scientific research in Ireland for 20 years, focused on generating the evidence needed to respond to environmental challenges such as climate change and biodiversity loss. The EPA places a high importance on ensuring that the outputs of EPA-funded research are effectively transferred to the policy system. With this in mind, the EPA is now actively embedding knowledge transfer processes right across its research programme, helping to bridge the gap between research and policy. Tara has previously worked in the EPA's licensing, circular economy and strategic environmental assessment units. Prior to joining the EPA, she carried out applied environmental research in the US, Australia and Ireland. She holds a BSc and PhD from NUI Galway, an MSc from the University of Edinburgh and a Fulbright Fellowship from the University of Colorado.

Keynote Speakers — Tuesday 26th March 2024

Waste Management & Circular Economy

Brian Gilmore

Cement Manufacturers Ireland

Brian Gilmore studied Natural Sciences in Trinity and obtained an MSc in 1990. He has been working in the cement industry for 17 years primarily focused on engaging with local communities, regulators and the media as the industry transitions away from fossil fuel and delivers on its climate action commitments. In addition to making cement, which is essential for our modern way of life, the high temperature manufacturing process offers huge potential to meet societies circular economy and resource recovery challenges. Prior to that he spent 11 years working in the waste industry innovating and problem solving for a diverse range of clients. The goal was always to find value in waste and establish sustainable recovery and recycling options.

Keynote Speakers

Tuesday 26th March 2024

Sustainable Energy Development

Irene Ward

SEAI

Irene Ward currently manages the RD&D programme in SEAI having joined the SEAI RDD team in 2021 as a Programme Executive. Prior to this she worked in Research Project Management roles based in UCD for national and international funded projects for 12 years. She has also held roles as a Centre Manager for in an International Centre for Mathematical Sciences at Heriot Watt and University of Edinburgh and a Community Education Manager in Cambridgeshire. Irene is committed to lifelong learning and research and has a BSc in Geography (Ulster), a PGCE (Leeds), an MSc in Management (UCD Smurfit) and is currently in the latter stages of an MSc in Environmental Sustainability (UCD).

Planning for Climate Change

Gill Higgins

Dawn Meats

Gill Higgins graduated from Trinity College Dublin in 2004 with a B.A. in Mathematics. As an undergraduate she worked as a Care Assistant at a residential hospital for special needs and challenging behaviour, and following graduation, she worked as a teaching assistant in the TCD School of Mathematics until 2006. Gill then began an 11-year career in Corporate Banking and Finance, before undertaking the Origin Green Ambassador Programme from 2017-2019. This 2-year Masters in Business Sustainability, arranged by Bord Bia and UCD Smurfit Graduate Business School, included 15 months of industry placements and Gill worked with McDonald's Global Supply Chain and Sustainability Team and with the M&S Plan A Team, in London. Upon completion of the MSc, Gill was appointed as Group Head of Sustainability for Dawn Meats and Dunbia, and more recently in 2022 was appointed Group Sustainability Director.

Keynote Speakers

Tuesday 26th March 2024

Incorporating Sustainability into the Curriculum

Daithí Brooks

An Taisce

Daithí Brooks is a Climate Action Officer with An Taisce, based in the Southwest. He supports Climate Ambassadors to take action in their communities, and is host of the forthcoming fourth series of 'The Climate Ambassador Podcast'. He has an MSc. in Environmental Psychology, and is interested in working with the power of values and identity to create change. Daithí has diverse experience in the eNGO and Environmental Education sector in Ireland.

Plenary Session 2

Wednesday 27th March 2024

Keynote Speaker

Tasneen Khan

Founder of SEA School, Dunmore East,

"On SEAing: Connecting Marine & Maritime Knowledge"

Tasneem Khan explores and interprets knowledge systems from coastal & marine landscapes - with an aim to juxtapose research and learnings from the Indian Ocean and the Atlantic. Researcher. Zoologist. Photographer. Educator. Diver. Sailor. Adventurer. Artist. - Tas is happiest underwater, knee-deep in the mangroves or working under the hull of a boat. She has been designing field-ecology curriculum through art-science methodologies for the past 15 years - the currents of her work have taken her from the equator to the arctic circle and her work has featured across numerous popular and scientific publications, art shows and modules. Currently living in Dunmore East, she has launched a community centred initiative SEA school, creating a living archive of coastal knowledges, seascapes and biodiversity influenced by the Ocean.

Keynote Speakers

Wednesday 27th March 2024

Biodiversity and Ecosystems

Dr Mark McCorry

Bord na Mona

Dr Mark McCorry PhD MCIEEM has been working as an ecologist within BnM for 14 years. He is now Ecology Team Manager. His main role is planning rehabilitation of BnM's cutaway bogs and developing rehabilitation plans for these sites. He currently leads a team of 9 Ecologists. Prior to joining BnM he worked as a consultant ecologist for 8 years. His PhD looked at the ecological impacts of Spartina anglica (an invasive grass) on the saltmarsh at Bull Island. He currently lives in Co. Laois and is the Botanical Society of Britain and Ireland recorder for the county along with his wife, Fiona MacGowan.

Green Chemistry for Sustainable Development

Prof Micheal Morris

Amber SFI

Prof. Morris leads the SFI funded research centre AMBER. His work has focused on self-assembly and phase separation in polymers and polymer solutions. Prof. Morris work also centres on the sustainability of materials. He leads a grant on looking at wood as a sustainable source of materials and particularly the use of forest waste. He also leads efforts in measuring the impact of circular solutions to new material technologies. He is a member of the ISO TC 323 technical committee developing standards for the circular economy. Prof. Morris has authored over 400 peer reviewed papers and more than 20 patents. Prof. Morris has worked closely with industry throughout his career. He leads the AMBER interaction with Merck in developing novel membrane materials and processes and works with several other collaborating AMBER companies PGCE and is completing an MSc in Environmental Sustainability.

ESAI AGM

Guest Speaker: ESAI Postgraduate Researcher of the Year 2023

Dr Adrienn Maria Szucs

TCD

Dr Adrienn Maria Szucs research is dedicated to addressing challenges in the extraction and separation of rare earth elements (REE), recognizing their critical role in a sustainable future.

Her research focuses on synthetic mineral precipitation, mimicking natural processes, to explore REE-carbonate deposits and study the unique behaviors of individual REEs. This approach has the potential to significantly improve the efficiency of REE exploitation, extraction, and separation, positively impacting both local and global resource availability. Also, her work facilitates the production of tailored REE-bearing carbonate and oxide minerals for various industrial applications.

Having earned her Ph.D. from Trinity College Dublin in 2023, Adrienn has transitioned into a postdoctoral researcher role at the National High Magnetic Field Laboratory, Florida. Her dedication to REE research persists, as she strives to contribute to sustainability initiatives

ESAI Student Competition 2024

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 at 13:45-14:30 on Wednesday 27th March. 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 Chartered Institution of Water and Environmental Management (CIWEM)
- Best Biodiversity Presentation (€250) sponsored by Chartered Institute of Ecology and Environmental Management (CIEEM)
- Best Social Engagement Presentation (€250) sponsored by Environmental Services Ireland
- Best Natural History Presentation (€250) sponsored by Irish Naturalists' Journal
- Best Organic Waste Recycling Presentation (€250) sponsored by Foster Environmental Ltd
- Best Analytical Chemistry Poster (€250) sponsored by Eurachem Ireland
- Richard Fitzgerald Memorial Prize Best Aquatic Environment Poster (€250) sponsored by AquaTT

Dr. Richard D. Fitzgerald Remembered

Richard was an exemplary fisheries zoologist. He was an excellent researcher and a gifted and inspiring lecturer. A UCC graduate [BSc and PhD], Richard was involved research and development in Aquaculture for almost 30 years in a variety of roles and posts in UCC, AquaTT and NUIG. He was also extremely interested in natural freshwater and marine fish populations, with a rare and extensive knowledge in both aquatic environments developed over the span of his career. He published over thirty peer reviewed publications, which are widely cited. Until the end of 2015, he was Research Co-ordinator and manager of the NUIG aquaculture research lab at Carna.

Richard was blessed with an insatiable curiosity about all research, particularly in the aquatic environment and the highlight of his annual visit to Environ was the poster sessions. His rule of thumb for all his students and employees was that they could go to any relevant conference as long as they produced a poster! Richard sadly passed away on December 5th 2016. Thank you to AquaTT for sponsoring the Richard Fitzgerald prize for best poster in Aquatic Environment.

ESAI ANNUAL REVIEW 2023

ESAI Chairpersons Address from Dr. Niamh Power

The Environmental Sciences Association of Ireland (ESAI) has been involved in a number of activities throughout 2023. This end of year report summarises some of the key events and activities throughout the year.

The highlight of the year was our Environmental Researchers Colloquium (Environ). The 2023 Environ conference was hosted in collaboration between the ESAI and Atlantic Technological University (ATU) on their Donegal campus. This Environ focused on the theme of "Evidence and Plans Towards Transitions to a Sustainable Future". The event took place from the 3rd to 5th of April 2023, slightly earlier than the 2022 conference returning it to its pre-covid calendar slot of the Easter timeframe. Environ 2023 commenced on the afternoon of Monday 3rd of April with a series of interactive workshops on Training Analysis & Career Development and Getting Ready to be a Sustainability Professional. Monday also saw a field trip to the beautiful Glenveagh National Park, which showcased the beauty of the environment we want to protect. Later that evening saw a lively Panel Debate on 'The Implication and Solution of Future Climate Change Actions on Agriculture', which was open to the public. The question and answer session which followed gave the audience an insight into the complexity and level of change required. 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 Denis McCrudden & Christopher McElemey and their team for hosting Environ 2023 at ATU. The colloquium in Donegal was a huge success and extremely well organised.

Over the summer period we saw the return of the ESAI undergraduate of the year. In 2023 we saw 12 students nominated by 10 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. We would like to extend our special thanks to all the college liaison officers who worked with us and organised the Level 7 and Level 8 nominees for their university.

Thanks to Dr Liam McCarton, 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 the criteria: [1] Scientific excellence and originality; [2] Impact economic/environmental/societal) and; [3] Dissemination (conferences, outreach, media). Congratulations to the winner Adrienn Maria Szucs, TCD. Adrienn's project is entitled "Advancing Rare Earth Element Science: Mimicking Nature for Sustainable Solutions and a Greener Tomorrow". This year the standard was extremely high, so much so that we wanted to recognize another postgraduate researchers work with a "Highly Commended" award. Congratulations to Sarpong Hammond Antwi, DKIT with their project entitled "Water Governance and Management Practices in the Republic Of Ireland: Past, Present and the Future".

Annual Review 2023

A key ESAI meeting was held in November 2023 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 research 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.

ENVIRON 2023

On behalf of all the team at the ESAI we would like to acknowledge and sincerely thank Environ 2023 conference co-convenors Dr Denis McCrudden and Christopher McElerney and all the ATU team on the Donegal campus 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 Ms Sinead Macken 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 2023, this event was again, well supported by the scientific community and wider public. The Panel discussion was on 'Climate Smart Agriculture' and the panel consisted of Dr James Moran ATU Galway, Mr Colm Markey MEP, Paul O Brien, IFA and Dr. Douglas MacMillan, Green restoration Ireland. The panel session and debate was chaired by Dr Edna Curley, Head of Centre at Mountbellew Agricultural College. Presentations from the panel were followed by a lively debate on the current and future implications of climate change on Irish agriculture in the context of reduction of greenhouse gas emissions.

Annual Review 2023

ESAI Prizegiving

The quality of research presented at Environ 2023 was exceptional with 70 oral presentations, 44 poster presentations, 114 abstracts and 215 delegates over the three days. 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 Mathew Cole, ATU Donegal for winning the ESAI Best Oral Presentation for his work on the 'Development of a low-cost portable system for the simultaneous detection of soil pH and potassium' and to Silvia Cascone, University of Galway for winning the ESAI Best Poster Presentation for her work on 'Coastal Dune Vulnerability Assessment as a Proxy for Nature-based Solution in Ireland.

Annual Review 2023

Early Careers Network

In September 2023 the Postgraduate Network changed its name to the Early Careers Network. The Early Careers Network will include researchers and those in industry and the cut-off point is 5 years post PhD and Masters. This change was brought about through the dedication of two of our council members Nicola Watson and Padraig McDonagh. This change is in recognition of the role of post-docs and early career researcher's in mentoring and guiding postgraduate students, it also stems from a need to feel part of a research community. Under the ESAI this Early Careers Network will bring together researchers under the umbrella environmental theme. The need of researchers to come together to take part in inter-disciplinary and multi-disciplinary teams is more important now than ever. And this multi-disciplinary aspect is very strong within the ESAI. A meeting of the Early Career Network will take place at Environ2024, to include a short Q&A with a "later stage" researcher followed by short breakout session in small groups. The aim being to highlight the benefit of being within the network, and what members would like to see from it.

ESAI HEI Undergraduate of the Year Award 2022/23

Commencing in 2017 and now in its 7th Year, the ESAI Undergraduate of the Year Award continues to be significant on the Island of Ireland. In 2023 we received 14 nominations from 12 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: Lizzy Armah Amakwa (Level 8, ATU Donegal), Adrian Leddy (Level 8, ATU Sligo), Jack O' Brien (Level 8, Dundalk Institute of Technology), Eoin Corbett (Level 8, MTU Cork), Michael Buckley (Level 7, MTU Cork), Shauna Mullowney (Level 8, SETU Waterford), Philip Brennan (Level 7, SETU Waterford), Taylor Vereecken (Level 8, SETU Carlow), Anna Morrison (Level 8, Trinity College Dublin), Lauren Woods (Level 8, TUS Thurles), Isabel Gogarty-Meade, (Level 8, University College Cork), Niamh Gurrin (Level 8, University College Dublin), Rachel Stewart (Level 8, Ulster University), Charlene Watters (Level 8, ATU Galway).

Annual Review 2023

ESAI Grassroots Award Scheme

The grassroots award, sponsored by the Environmental Protection Agency (EPA), has funded a total of eight successful workshops since 2015. 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. Details of the scheme can be accessed on our website www.esaiweb.org. You can also access videos from previous winners. The first award of this funding stream was allocated to Brakemi Egbedi of SETU Waterford entitled "Fostering collaboration between research and industry for shell waste utilization towards the realization of a circular blue economy". 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 lead by Dr. John Gallagher, TCD. We welcome your input and participation through our social media channels whether through our Listserver, LinkedIn, Facebook, Twitter or by subscribing to our Newsletters. At the end of 2023 the ESAI had 807 members, comprising of 187 full members and 620 student members. Social media reach has increased marginally on social media platforms during 2023 now with >10,000 connections and an increase of 2.3% (+222) LinkedIn connections in 2023, 3.5% (+118) Twitter followers, and maintaining similar numbers of Facebook friends, Newsletter readers and Listserver mailees.

A review of communications and the ESAI website is continuing, with costs to revamp and streamline systems and processes is proving to be expensive. A recent website crash, issues with payment system etc will result in a thorough review of communications post Environ 2024.

ESAI Council Meeting and AGM

The ESAI had a busy year in 2023, with three Council meetings, one special Council Meeting, one AGM and a strategy day. The AGM was convened to coincide with Environ 2023 and therefore held in ATU Donegal Campus. This AGM saw the stepping down of our previous Chairperson Dr. Liam McCarton, Liam was Chair of the ESAI for three years and his dedication to the role is without fault. Liam was Chair during Covid when it is safe to say that he steadied the ship, when the Environ Conference, which was due to be hosted in April 2020, had to be rescheduled at short notice, his support to pivot the conference to an online conference later that year was truly invaluable. During this time Liam took all issues, Covid, the knock-on financial issues in his stride and has provided the ESAI on-going support through his experience and wisdom. We would like to take this opportunity to thank Liam for his contribution and on-going support.

Dr. Niamh Power, ESAI Chairperson

Niamh is a Principal Investigator within in Sustainable Infrastructure Research & Innovation Group and an Academic Developer with the N-TUTORR project.

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 over 300 delegates each year.
- Discounted rates for selected workshops, seminars, further education courses and conferences.
- Access to ESAI listserver
- 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/

2023 Events

Date	Event
February 28th	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
April 3rd - 5th	**Environ 2022 – 33rd Annual Irish Environmental Researchers Colloquium** ATU Donegal
April 4th	**ESAI AGM 2023** (held in conjunction with Environ 2023) All members welcome
April 31st	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
June	**ESAI Undergraduate of Year Awards 2022/2023** Review with HEI's commences
June 30th	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
August 31st	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
September 4th	**ESAI HEI nominated Undergraduate of Year 2021/22** Announcements and presentation of certificates (by post!)
October 31st	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
November 3rd	**Undergraduate Membership Offer** Free Membership for all Undergraduate Members Scheme Rolled Out
December 31st	**ESAI Grassroots Workshop Support Scheme** Sponsored by EPA – Rolling Call
December 31st	**ESAI Postgraduate Researcher of Year Award** Closing date for applications

ESAI INCOME AND EXPENDITURE ACCOUNT 2023

ESAI Income and Expenditure Account	€	€
For the year ended 31 December 2023		26,941
Opening balance as 01/01/23		
Income	€	€
Membership	1,872	
Environ 2023 – Delegate Fee	27,504	
Environ 2023 - Sponsorship	18,790	
Environ 2022 - Sponsorship	1,000	
Prizes	1,750	
Rebates	72	
Grassroots	3,000	
Total Income	**53,988**	
Expenditure	€	€
Environ 2024	403	
Environ 2023	37,532	
Environ 2022	4,335	
Prizes	3,765	
Website Maintenance	3,348	
Administration	16,301	
Travel	329	
Accountancy	46	
Bank Charges	315	
Merchant Banking	1,035	
Postage/Stationary	113	
Other	655	
Excess Expenditure over Income		**- 14,187**
Closing Balance @ 31/12/23		**12,754**

End of Year accounts are overseen and approved by external accountant

ESAI Council Members 2023

Chairperson	Dr Niamh Power	chairperson@esaiweb.org
Honorary Secretary	Mr Philip Shine	secretary@esaiweb.org
Honorary Treasurer	Dr Thomaé Kakouli-Duarte	treasurer@esaiweb.org
Communications Officer	Dr John Gallagher	communications@esaiweb.org
Editor	Ms Caroline Wynne	c.wynne@epa.ie
Conference Coordinator 2024	Dr Graece Tan	SETU Waterford
Conference Coordinator 2023	Dr Denis McCrudden	ATU Donegal
Regular Members	Prof Frances Lucy – ATU Sligo Dr Tom Curran - UCD Dr Dorothy Stewart - EPA Dr Denis McCrudden - ATU Donegal Mr Liam McCarton - TU Dublin Prof Pilar Fernandez Ibanez - Ulster University	
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 2024

South East Technological University Waterford

25th - 27th March 2024

34th Irish Environmental Researchers Colloquium

**"Harvest to Harbour:
Research from Soil to Sea"**

ORAL AND POSTER PRESENTATIONS SCHEDULE

Monday, 25 March

10am — **Registration (Display poster)**

10:15am — **Field Trips (Anne Valley Park Guided Walk & Copper Coast Geopark Guided Tour)**
Main Campus Carpark, SETU, Waterford

3pm — **Greener Lab Workshop & Discussion**
Tourism & Leisure Building, Seasons Restaurant, SETU Waterford

7pm — **Public Engagement Panel Discussion & Q&A session: How to Run Business Sustainably**
Main Auditorium, SETU, Waterford

Tuesday, 26 March

8:15am — **Registration (Display poster)**
Main Entrance, SETU, Waterford

9:15am — **Environ 2024 opening session**
Main Auditorium, SETU, Waterford

9:45am — **Plenary Lecture 1**
Main Auditorium, SETU, Waterford

Milestones of this Mandate
» Grace O'Sullivan

10:15am — **Plenary Lecture 2**
Main Auditorium, SETU, Waterford

Bridging the gap: connecting EPA Research with policy
» Dr. Tara Higgins

10:45am — **Networking, Poster Session & Meet the Exhibitors**
Atrium, Outside Auditorium, SETU, Waterford

11:30am — **Climate Policy & Communications**
Room FO1, Tramore Lecture Room, SETU, Waterford
Chaired by: Dr. Dorothy Stewart

11:30am — **The right to a healthy environment in Ireland: where are we at after Coyne v An Bord Pleanála?**
» Mr. Julian Suarez

11:45am — **Micro-solutions to Meta-crises**
» Dr. Ruth Quinn, Dr. Natalie Delimata

12pm — **Preliminary Findings from a 2023 All-Island Research Initiative on Financial Solutions to Biodiversity Loss**
» Prof. Sheila ODonohoe, Dr. Lisa Sheehan

12:15pm — **The Use of Science in EU Environmental Decision-Making: A Measure of Legitimacy in Environmental Regulation**
» Ms. Rhoda Jennings

Continued from **Tuesday, 26 March**

12:30pm **ENABLE-BIO: bringing clarity to Bioeconomy regulations, to create a roadmap towards the creation of an enabling regulatory environment for the development of biobased innovations**
» Mr. Robert Ludgate, Dr. Theresa Rubhara, Dr. Luke Kelleher, Dr. Eoin O'Neill, Dr. Helena Mc Mahon

12:35pm **Examining the Drivers that Shape Sustainable Consumer Behavioral Intentions of Regional Leisure and Visiting Friends and Relatives (VFR) Passengers in the Irish Aviation Industry.**
» Ms. Amy Whelan

11:30am Sustainable Green Building & Future Proofing Our Forest

Room F02, Dunmore Lecture Room, SETU, Waterford
Chaired by: Dr. John Gallagher

11:30am **Life Cycle Assessment of Harvested Wood Products for Buildings in Ireland**
» Dr. William Horan, Mr. Song Ge, Dr. Patrick McGetrick, Dr. David Styles, Dr. Michael Quilligan

11:45am **Energy efficiency intervention methodologies for buildings with historic and architectural value in Europe: A case study for Romanian heritage buildings**
» Mrs. Simona Serban, Prof. Tiberiu Catalina

12pm **Digital Twin for smart and sustainable cities: a comprehensive review**
» Mr. Bogdan Gheorghe

12:15pm **Irish Tree Explorers Network – Cultivating a deep appreciation of Ireland's forests and trees through public engagement.**
» Ms. Emma Hutchinson

12:30pm **Impacts of Weather and Human Intervention on Historical Forestry Pest Outbreaks on the Island of Ireland**
» Mr. Ultan O'Donnell, Dr. Conor Francis McGee, Dr. Jon Yearsley

11:30am Sustainable Energy Development

Room F03, Ardmore Lecture Room, SETU, Waterford
Chaired by: Irene Ward

11:30am **Research Funding Supports at SEAI**
» Irene Ward

11:45am **Development of data-driven digital solutions for the predictive maintenance of hydropower plants**
» Mr. Bhaskar Paudel, Prof. Aonghus Mc Nabola

12pm **Numerical Modelling for Energy Efficiency Optimisation in Industry**
» Mr. Patrick Donnellan, Mr. Arun Antony, Dr. Ramesh Raghavendra

12:15pm **Digitalisation of existing hydropower plants to predictive maintenance and improved efficiency, lifetime and cost-effectiveness.**
» Mr. Maciej Janiszkiewicz, Dr. Aonghus Mc Nabola

12:30pm **Using a large-scale electrolyser plant to improve fault resilience and reduce the DC link capacitor size in a HVDC-connected offshore wind farm**
» Ms. Huong Le, Dr. Paul G. Leahy, Dr. Padraig Lyons

12:45pm **Developing pathways for a sustainable shipping and maritime fuel in Ireland**
» Mr. Asif Tanvir Bhuiya, Dr. Nathan Gray, Dr. Richard O'Shea, Dr. David Wall, Prof. Jerry Murphy

11:30am Sustainable & Regenerative Agriculture

Room F04, Lismore Lecture Room, SETU, Waterford
Chaired by: Prof. Frances E Lucy

11:30am **Creating an Agroforestry Module on the HOLOS-IE Digital Platform for Assessing Carbon-Neutral Agricultural Farming**
» Ms. Mahjabin Siddique, Dr. Rem Collier, Mr. Badhan Sen, Ms. Sarah Pogue, Mr. Aaron Mcpherson, Dr. Roland Kröbel, Prof. Bruce Osborne, Mr. Cormac Farrelly, Dr. Ibrahim Khalil

Continued from **Tuesday, 26 March**

11:45am **Direct and legacy effects of sulphur fertilisation on microbial soil organic matter mineralisation and priming effect.**
» Mr. Yahaya Jebril Amanor, Dr. Eric Paterson, Dr. Nabla Kennedy, Dr. David Wall, Dr. Fiona Brennan

12pm **ReNu2Cycle – Maximising Recycling Derived Fertiliser use and closing the nutrient cycle.**
» Mr. Robert Ludgate, Dr. Niamh Power

12:15pm **Plant variety and fertilizer choice affect bacterial potential to mobilize phosphorus in potato rhizospheres**
» Ms. Tasfia Mostafa, Dr. Achim Schmalenberger

12:30pm **The Effect of Mn and S Soil Application on NUE and N Cycling in a Two Year Winter Wheat Lysimeter Experiment**
» Ms. Saoirse Sheehy Ariff, Dr. Paul Murphy, Dr. Saoirse Tracy, Mr. David Langton

12:45pm **An evaluation of multispecies and grass-clover swards in a dairy grazing platform**
» Ms. orla mattimoe, Dr. John Finn, Dr. Michael Dineen, Dr. Karina Pierce, Mr. Aidan Lawless, Dr. Bridget Lynch

1pm **Lunch**
Viking Food Hall, SETU, Waterford

1:30pm **ESAI Early Careers Network (ECN) meeting**
Main Auditorium, SETU, Waterford

2pm **Waste Management & Circular Economy**
Room FO1, Tramore Lecture Room, SETU, Waterford
Chaired by: Brian Gilmore

2pm **Build a Career in Cement!**
» Brian Gilmore

2:15pm **The upgrading of brewers' spent grain as a novel functional food ingredient**
» Ms. Jiao Zhang, Dr. Ariane Perez-Gavilan, Dr. Adriana Cunha Neves

2:30pm **Measuring Progress in the Circular Economy: the case of CMUR**
» Dr. Jack McCarthy, Mr. Colman McCarthy, Dr. Carlos Pablo Siguenza, Dr. Colum Gibson, Mrs. Claire Downey, Mr. Gergo Suto

2:45pm **Novel value chain connections for food loss and waste prevention**
» Dr. Tracey O'Connor, Dr. MaryAnne Hurley, Ms. Aoibheann O'Brien, Dr. Jennifer Attard

3pm **Biorefining Biowaste Digestate into Biostimulant and Soil Conditioner in a Circular Economy Context**
» Mr. Shon Shiju, Mr. Patrick Quille, Dr. Eilish Broderick, Dr. Gaurav Rajauria

3:15pm **Exploring the use of experiential marketing and extended reality technology to support the customer learning process of sustainability policies and principles.**
» Ms. Rumbidzai Gandiwa, Dr. Rose Leahy, Dr. Pio Fenton

3:20pm **REcycling of NUtrients to close the fertiliser CYCLE: the daughter project of ReNu2Farm works for soil nutrient sustainability in North West Europe**
» Dr. Thomais Kakouli-Duarte, Dr. Kieran Germaine, Ms. Lilian Atira, Mr. Conor Geoghehan

3:25pm **FoodPath - Investigating behavioural interventions to reduce food waste in Irish households**
» Ms. Keelin Tobin, Dr. Colum Gibson, Prof. Alberto Longo

2pm **Environmental Monitoring**
Room F02, Dunmore Lecture Room, SETU, Waterford
Chaired by: Prof. Thomas Curran

2pm **How STREAM put the I into IoT**
» Mr. John Ronan, Mr. Hugh O'Sullivan, Dr. Joseph O'Mahony, Mr. Benyuan Yu, Mr. Jerry Horgan, Dr. Ronan Browne

Continued from **Tuesday, 26 March**

2:15pm **Development of a novel spectroscopic sensor for fast nitrogen dioxide measurements**
» Ms. Eibhlin Halpin

2:30pm **WIBS-4+ bioaerosol sensor: an assessment of its intended-use, and an evaluation of alternative aerosol applications**
» Dr. Jerry Hourihane Clancy, Dr. Emma Markey, Ms. Gemma Davis, Dr. Moisés Martínez Bracero, Dr. Roland Sarda Estéve, Dr. David O'Connor

2:45pm **Silicon Transistors as Nitrogen Dioxide Sensors**
» Ms. Vaishali Vardhan

3pm **A novel application of environmental impact assessments for coastal zone restoration**
» Ms. Melissa Taylor, Ms. Shiau Pin Tan, Prof. Helen Hughes

3:15pm **A compact light weight instrument for in situ detection of I2 and IO in the marine boundary layer**
» Mr. SHOGO SAITO, Dr. Caroline Womack, Dr. Steven Brown, Prof. Andy A. Ruth

2pm Sustainable Energy Development

Room F03, Ardmore Lecture Room, SETU, Waterford
Chaired by: Dr. Niamh Power

2pm **Optimisation, Performance Modelling and Scale-up of a Bubble Column for Photosynthetic Biogas Upgrading**
» Ms. Nikita Verma, Dr. David Wall, Dr. Archishman Bose, Prof. Jerry Murphy, Dr. Fatemeh Kavousi

2:15pm **Integration of anaerobic digestion system with microalgae-based carbon capture and recycling to improve the process parameters in a circular bioeconomy paradigm**
» Mr. Muhammad Nabeel Haider, Dr. Archishman Bose, Prof. Jerry Murphy, Dr. David Wall, Dr. Linda O'Higgins

2:30pm **Exploiting operational modes and Powdered Activated Carbon (PAC) addition for promoting syntrophic propionate oxidation during anaerobic digestion of complex organics.**
» Mr. Mabruk Adams, Ms. Yuyin Wang, Mr. Bang Du, Dr. Indiana Olbert, Dr. Guangxue Wu

2:45pm **Cobalt selenides and composites as electrocatalysts for Water Splitting: A comparative study**
» Ms. Gillian Collins, Prof. Carmel Breslin

3pm **Conversion of ammonium (NH4+) to green hydrogen using electroactive anammox bacteria**
» Dr. Masoud Ghaani, Mrs. Fateme Saadatinavaz, Dr. Muhammad Ali

3:15pm **Determining the potential for co-benefits for biodiversity conservation and renewable energy generation in solar farms in Ireland**
» Mr. Sean Morris, Mr. James O'Riordan, Ms. Anita Ortega, Dr. Sarah McCormack, Dr. Jane Stout

2pm Sustainable & Regenerative Agriculture & Soil Health & Use

Room F04, Lismore Lecture Room, SETU, Waterford
Chaired by: Dr. Thomais Kakouli-Duarte

2pm **Herbicide Resistance: a threat to Irish arable crop production**
» Ms. Charlotte Morgan, Dr. Vijaya Bhaskar AV, Dr. Susanne Barth, Dr. Trevor R. Hodkinson

2:15pm **Investigation on the use of calcium alginate beads formulation for developing plant health biological product**
» Mrs. Islam Ahmed Abdelalim Darwish, Dr. Daniel Martins, Dr. David Ryan, Dr. Thomais Kakouli-Duarte

2:30pm **Farming for Soil Health: Effects of grassland agricultural management systems on the microbial diversity and functions of soils**
» Mr. Sean Conway, Dr. Kerry Ryan, Dr. Aaron Fox, Dr. David Wall, Dr. Florence Abram, Dr. Orla O'Sullivan, Dr. Tim Mauchline, Dr. Fiona Brennan

Continued from **Tuesday, 26 March**

2:45pm **Soil specificity of potassium dynamics in temperate grassland soils: A soil mesocosm study**
» Mr. Thomas McCarthy, Dr. James Humphreys, Dr. Imelda Casey, Dr. Patrick Forrestal, Dr. David Wall

3pm **Investigating the effects of glyphosate-based herbicides and their alternatives on the soil microbiome**
» Ms. Sophia Couchman, Dr. Mathavan Vickneswaran, Dr. Grace Hoysted, Mr. Stephen Seaman, Mr. Dónall Flanagan, Dr. James Carolan

3:15pm **Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland**
» Ms. Michaela Bartley

3:30pm **Networking, Poster Session & Meet the Exhibitors**
Atrium, Outside Auditorium, SETU, Waterford

4:15pm **Planning for Climate Change**
Room FO1, Tramore Lecture Room, SETU, Waterford
Chaired by: Gill Higgins

4:15pm **Plan Four Zero**
» Gill Higgins

4:30pm **Life cycle assessment of a direct air capture and storage plant in Ireland**
» Mr. Daniel Casaban, Dr. Elena Tsalaporta

4:45pm **Measuring climate change vulnerability in data-scarce regions using statistical analysis in GIS**
» Mr. Keegan Covey

5pm **Hidden and shallow peat in the new Irish Peat Soils Map**
» Dr. Louis Gilet, Dr. Terry Morley, Dr. Raymond Flynn, Dr. John Connolly

5:15pm **Supporting a Digital Transformation in Rural Water Communities**
» Dr. Saravanan Gurusamy, Ms. Katherine Hardgrave, Mr. Xiaoyu Wang, Dr. Harun Siljak, Dr. John Gallagher

4:15pm **Environmental Monitoring**
Room F02, Dunmore Lecture Room, SETU, Waterford Chaired by: **Dr. Graece Tan**

4:15pm **Ability of Steinernema feltiae nematode to locate and kill Galleria mellonella larvae in sand contaminated with hexavalent chromium VI.**
» Dr. Anique Godjo, Ms. Lucile Ansaldi, Dr. Stephen Boyle, Dr. John Byrne, Dr. Thomais Kakouli-Duarte

4:30pm **Leveraging high-density air quality sensor networks for source analysis of local PM2.5 pollution**
» Ms. Rósín Byrne, Prof. John C. Wenger, Dr. Stig Hellebust

4:45pm **Calcium Peroxide and 3-Nitrooxypropanol as Feed Additives: Residual Effects on Gaseous Emissions during Cattle Slurry Storage**
» Mr. Benjamin Peter Macartan, Ms. Emily Roskam, Dr. Shaun Connolly, Dr. Dominika Krol, Prof. Thomas Curran

5pm **A new cavity ring-down instrument for airborne monitoring of N2O5, NO3, NO2 and O3 in the upper troposphere lower stratosphere**
» Mr. Paul Wills, Dr. William Dubé, Dr. Andreas Zahn, Dr. Steven Brown, Prof. Andy A. Ruth

4:15pm **Incorporating Sustainability into Curriculum**
Room F03, Ardmore Lecture Room, SETU, Waterford
Chaired by: Dr. Orla O'Donovan

Continued from **Tuesday, 26 March**

4:15pm **Climate Action and Adaptation**
» Mr. Daithí Brooks

4:30pm **Emotionality and Empowerment in Sustainability Education**
» Dr. Emer Emily Neenan

4:45pm **Learners as Problem-solvers: Experiential and Community-engaged Learning for Effective Sustainability Learning**
» Ms. Hayette Bellakehal, Dr. Emer Emily Neenan

4:15pm **Land & Sea Carbon Capture & Maximising Marine & Coastal Resources**
Room F04, Lismore Lecture Room, SETU, Waterford
Chaired by: Dr. Evelyn Landers

4:15pm **Resources for understanding and reporting Carbon from a 'blue carbon' perspective**
» Ms. Avery Fenton, Prof. Mark Johnson, Prof. Dagmar B. Stengel, Dr. Rachel Cave

4:30pm **Assigning recreational value to a specific coastal ecosystem in a travel cost modelling context**
» Ms. Geraldine Doolan, Prof. Stephen Hynes

4:45pm **Sustainable Extraction of Protein from Duckweed**
» Mr. Jack Prendeville, Mrs. Karen Hussey, Ms. Laura Hinds, Prof. Marcel Jansen, Prof. Brijesh Tiwari

5pm **Do pathogens and/or localised environmental factors influence growth in Irish native oysters Ostrea edulis and rock oysters Crassostrea gigas?**
» Ms. Vivian Hlordzi, Mrs. Sharon Lynch, Mrs. Sarah Culloty

5:15pm **Stability Assessment and Characterization of Whelk Shell Calcined Calcium Oxide (CaO) for Practical Applications**
» Ms. Fatima Zahra, Dr. Mike Kinsella, Prof. Helen Hughes, Ms. Shiau Pin Tan

5:15pm **ESAI AGM Featuring presentation from ESAI Postgraduate of the Year 2023 Winners**
Main Auditorium, SETU, Waterford

7pm **Conference Gala Dinner, followed by live music & dancing**
Tower Hotel, Waterford City

Wednesday, 27 March

9am **Registration**
Main Entrance, SETU, Waterford

9:30am **Plenary Lecture 3**
Main Auditorium, SETU, Waterford

On SEAing: Connecting Marine & Maritime Knowledge
» Tasneem Khan

10am **Biodiversity & Ecosystem**
Room FO1, Tramore Lecture Room, SETU, Waterford
Chaired by: Mark McCorry

10am **Peatland Restoration. The Bord na Mona Story**
» Mark McCorry

10:15am **Evaluating Agri-environmental Measures for Conserving Bumblebees**
» Ms. Lydia Thompson, Ms. Alex Hayden, Dr. Karina Dingerkus, Dr. Dara Stanley

Continued from **Wednesday, 27 March**

10:30am **Leveraging Environmental DNA for Monitoring and Managing Irish Invasive Species**
» Dr. Stephanie Coster, Dr. Allan McDevitt, Dr. Luca Mirimin

10:45am **The role of effective freshwater protected areas in the restoration of freshwater biodiversity in the European Union**
» Ms. Lisa Cronin, Prof. Fiona Regan, Prof. Frances E Lucy

10am Environmental Monitoring

Room F02, Dunmore Lecture Room, SETU, Waterford
Chaired by: Dr. Joe Murphy

10am **Monitoring Contaminants of Emerging Concern (CECs) in Dublin Bay: Exploring New Analytical Approaches**
» Dr. Enrique Jacobo Diaz-Montaña, Dr. Chloe Richards, Dr. Brendan McHugh, Dr. Evin McGovern, Dr. Belinda Huerta, Prof. Fiona Regan

10:15am **Detection and enumeration of Shiga toxin-producing Escherichia coli (STEC) serogroups and virulence factors from surface waters and private wells within the Corrib catchment, western Ireland**
» Dr. Zina Alfahl, Dr. Louise O'Connor, Prof. Dearbhaile Morris, Ms. Anna Lineen, Ms. Laura Moore, Dr. Jean O'Dwyer, Prof. Paul D. Hynds, Dr. Liam Burke

10:30am **METAL ACCUMULATION IN SEAFOOD AND FISH PRODUCTS SOLD IN NIGERIAN MARKETS**
» Mrs. CHINELO ANULIKA NZEKWE, Dr. Timothy Sullivan, Prof. Deborah Chapman

10:45am **High Resolution Basemaps and Orthographic Site Images – Fast, Easy & Robust**
» Dr. Richard Terres

10:50am **Improving intertidal seaweed classification using UAV RGB and multispectral sensing**
» Mr. Damir Akhmetshin, Dr. Leon Cavanagh, Dr. Dean Callaghan, Dr. Owen Naughton

10am Incorporating Sustainability into Curriculum

Room F03, Ardmore Lecture Room, SETU, Waterford
Chaired by: Dr. Nataliya Romanyatova

10am **Incorporating Sustainability Case Studies into the Curriculum**
» Dr. Nataliya Romanyatova

10:15am **A conceptual National Framework of Qualifications taxonomy for academics using Transformative Sustainability Learning**
» Dr. Paul O'Leary

10:30am **How do we embed sustainability into higher education – a conversation with stakeholder?**
» Dr. Niamh Power, Dr. Tom Farrelly

10:45am **A Practical Toolkit Supporting Educators to Incorporate Sustainability in Third Level Curriculums**
» Dr. Emer Emily Neenan, Dr. Nataliya Romanyatova, Ms. Ailish O'Brien

10am Water Quality & Health

Room F04, Lismore Lecture Room, SETU, Waterford
Chaired by: Dr. Eleanor Owens

10am **The Detection of Contaminants of Emerging Concern, Bifenthrin, Estrone, and Diclofenac using SPE and HPLC-UV methods.**
» Ms. Jodie Bermingham, Dr. Caroline Murphy, Dr. Chloe Richards, Dr. Belinda Huerta, Dr. Dylan O'Flynn, Dr. Ciprian Briciu-Burghina, Dr. Enrique Jacobo Diaz-Montaña, Prof. Fiona Regan

10:15am **Microplastic Detection in Drinking Water**
» Dr. Junli Xu

10:30am **The Detection of Poly- and Perfluoroalkyl Substances (PFAS) in Transitional and Marine Water – a Dublin Bay study**
» Ms. Helen Burke, Dr. Belinda Huerta, Dr. Enrique Jacobo Diaz-Montaña, Prof. Fiona Regan

Continued from **Wednesday, 27 March**

10:45am **Emerging ocean contaminant sensing using antibody-based optical detection technologies**
» Dr. Caroline Murphy, Dr. Sean Power, Dr. Weili Guo, Dr. Louis Free, Dr. Chloe Richards, Dr. Ciprian Briciu, Prof. Anne Parle-McDermott, Prof. Fiona Regan

11am **Networking, Poster Session & Meet the Exhibitors**
Atrium, Outside Auditorium, SETU, Waterford

11:45am **Biodiversity & Ecosystem**
Room FO1, Tramore Lecture Room, SETU, Waterford
Chaired by: Dr. Cara Daly

11:45am **Prevalence and diversity of plant parasitic nematodes in the Irish peatlands**
» Dr. Anusha Pulavarty, Mr. Tilman Klappauf, Dr. Douglas McMillan, Dr. Thomais Kakouli-Duarte

12pm **Boom-Bust dynamics in native and non-native mussel species and their hybrid crosses in Irish near shore environments over two decades.**
» Mrs. Dulani Wickramanayaka, Mrs. Sharon Lynch, Mrs. Sarah Culloty

12:15pm **Risk perceptions of outdoor professionals and recreationists relating to Lyme borreliosis in Ireland**
» Dr. Ríona Walsh, Prof. Mike Gormally, Dr. Christopher Williams, Dr. Caitríona Carlin

12:30pm **Assessment of Ulva intestinalis (Chlorophyta) optimal growth factors under laboratory conditions**
» Ms. Vanessa Nardini, Prof. Dagmar B. Stengel

12:35pm **Net Ecosystem CO2 Exchange From a Peatland Under Restoration**
» Mr. Md Shamsuzzaman, Dr. Shane Regan, Mr. Mark O'Connor, Dr. Ultan Mc Carthy, Dr. Imelda Casey, Dr. Owen Naughton

11:45am **Wastewater Treatment & Management**
Room F02, Dunmore Lecture Room, SETU, Waterford
Chaired by: Prof. Helen Hughes

11:45am **Improving water quality using low-cost waste materials**
» Ms. Brakemi Egbedi, Dr. Mike Kinsella, Ms. Shiau Pin Tan, Prof. Helen Hughes

12pm **Hydrothermal carbonization or low-temperature pyrolysis – which is better for nutrient recovery from dairy processing sludges?**
» Ms. Anna Kaskova, Dr. Marzena Kwapinska, Dr. Witold Kwapinski, Dr. James J Leahy

12:15pm **Expression and functional characterization of recombinant metallothionein proteins of water lettuce (Pistia stratiotes) and water hyacinth (Eichhornia crassipes) in E. coli**
» Mr. Tapiwa Nyakauru, Dr. Orla O'Donovan, Dr. Catherine O'Reilly, Dr. David O'Neill

12:30pm **A Low-cost Material for the Adsorption of Antibiotics**
» Mr. Erwin Onyekachukwu, Dr. Heather Nesbitt, Dr. Svetlana Tretsiakova-McNally, Dr. Heather Coleman

12:45pm **Cultivation of high-protein plant biomass using an agri-food wastewater for a circular economy**
» Ms. Jingrou Chen, Prof. Marcel Jansen, Dr. Neil Coughlan

11:45am **Green Chemistry for Sustainable Development**
Room F03, Ardmore Lecture Room, SETU, Waterford
Chaired by: Prof. Michael Morris

11:45am **Sustainability of semiconductor fabrication**
» Prof. Michael Morris

12pm **Green chemistry synthesis of Cyclodextrin:fatty acids complexes: A sustainable approach alternative to antibiotics**
» Mr. Dileep Reddy, Ms. Shiau Pin Tan, Dr. Laurence Fitzhenry

Continued from **Wednesday, 27 March**

12:15pm **Designing a methane removal biological filter for on-site wastewater treatment systems**
» Dr. Morgane Bellec, Dr. Masoud Ghaani, Dr. Muhammad Ali, Prof. Laurence Gill

12:30pm **TRASH TO TREASURE: HARNESSING THE POWER OF AGRICULTURAL WASTES FOR GENERATING CLEANER WATER**
» Mr. Lekan Abudu, Ms. Rutuja Bhosale, Dr. Joerg Arnscheidt, Dr. Svetlana Tretsiakova-McNally, Dr. David Adeyemi, Prof. Luqman Adams, Dr. Temilola Oluseyi, Dr. Barry O'Hagan, Dr. Heather Coleman

11:45am **Water Quality & Health**
Room F04, Lismore Lecture Room, SETU, Waterford
Chaired by: Dr. Mike Kinsella

11:45am **Longitudinal monitoring of Escherichia coli concentrations in surface waters and groundwater supplies within an Irish catchment during a series of extreme climate events.**
» Mr. Robert Hynes, Dr. Zina Alfahl, Ms. Florence De Bock, Dr. Louise O'Connor, Dr. Paul D. Hynds, Dr. Jean O'Dwyer, Dr. Liam Burke

12pm **Determination of aluminium in fish tissue to ensure the safety of phosphorus fixing chemicals: the case of two Irish lakes**
» Mr. Juan Federico Bennett, Dr. Brian Rippey, Dr. Julie Campbell, Dr. Richard Douglas

12:15pm **Hydrological Simulation for the Owenabue Catchment – Application of the SWAT+ Model**
» Mr. Rodhraí Crowley, Dr. Joe Harrington, Dr. Juan Tomás García, Dr. Juan Manuel García-Guerrero

12:30pm **Poly- and Perfluoroalkyl Substances (PFASs) from Source to Sink in the River Liffey**
» Ms. Leila Bowe, Dr. Enrique Jacobo Diaz-Montaña, Prof. Fiona Regan, Dr. Belinda Huerta

12:45pm **Lunch**
Viking Food Hall, SETU, Waterford

1:45pm **Student Prize Giving Ceremony 'Best in Conference' & Close of Environ 2024**
Main Auditorium, SETU, Waterford

Planning for Climate Change Posters
Atrium, Outside Auditorium, SETU, Waterford

A Bibliometric Analysis of the Research Publications on Climate Change for the Last 7 Years
» Mr. Asfand Bakht Yar, Dr. Ken Boyle

Climate change vulnerability of cultural landscapes and intangible heritage: a research gap between nature, culture, and community
» Ms. Samantha Tobias

Development of a Cumulative Effects Assessment Framework for Ireland's Marine Planning Process
» Ms. Virginia Morejón

Environmental Monitoring Posters
Atrium, Outside Auditorium, SETU, Waterford

Detection of PMT Chemicals in Environmental Samples via SPE and HPLC Analysis
» Mr. Alexander Savelev, Ms. Rebecca Smith, Dr. David O'Connor, Prof. Fiona Regan

Evaluation of air quality patterns in Dublin pre to post COVID-19 restriction
» Mrs. Grace Udoka, Prof. Patrick Goodman, Dr. Eoin McGillicuddy, Dr. Nwachi Louis

Continued from **Wednesday, 27 March**

Analysing the Impact of Diesel Train Movements on PM2.5 Levels in Dublin Heuston Station Using Random Forest Models
» Mr. YUXUAN GUO, Mr. Shanmuga Priyan, Dr. John Gallagher, Prof. Aonghus Mc Nabola, Prof. Margaret O'Mahony, Prof. Brian Broderick, Prof. Brian Caulfield

Radioactivity in salmon *(Salmo salar)* and oysters *(Crassostrea gigas)* farmed in the Irish Sea and North Atlantic waters.
» Mr. Angus Collison, Dr. Claire Keary, Dr. Liam Morrison, Ms. Olwyn Hanley, Dr. Joe Murphy, Prof. Luis León Vintró

Optimisation of SPE and LC-MS Methods for the Determination of Antibiotic Concentration in Liquid Samples.
» Ms. Kalina Dobrowolska, Dr. Xinmin Zhan, Dr. Shohei Yasuda, Dr. Dylan O'Flynn, Dr. Chloe Richards, Prof. Fiona Regan

Experiences and recommendations from the implementation of low-cost soil moisture and water table sensors
» Dr. Ciprian Briciu-Burghina, Dr. Muhammad Intizar Ali, Prof. Fiona Regan

Photonic Integration of Quartz Enhanced Photoacoustic Spectroscopy Sensors for Greenhouse Gas Detection in Agriculture
» Mr. Cian Twomey, Mr. Gabriele Biagi, Prof. Andy A. Ruth, Dr. Marilena Giglio, Prof. Vincenzo Spagnolo, Dr. Liam O'Faolain, Dr. Anton Walsh

MoSe2-Graphene Electrochemical Sensors for Drug Detection in Aquatic Environments
» Ms. Tara Barwa, Prof. Carmel Breslin

Sensing and Monitoring of Airborne Real-Time Pollen
» Ms. Gemma Davis, Dr. Emma Markey, Dr. Jerry Hourihane Clancy, Dr. Moisés Martínez-Bracero, Dr. David O'Connor

The Irish Atmospheric Simulation Chamber: A national facility for atmospheric sciences
» Mr. Amir Ben Brik, Prof. Andy A. Ruth, Dr. Satheesh Chandran, Dr. Mixtli Campos, Prof. John C. Wenger

A compact light weight instrument for in situ detection of I2 and IO in the marine boundary layer
» Mr. SHOGO SAITO, Dr. Caroline Womack, Dr. Steven Brown, Prof. Andy A. Ruth

A new cavity ring-down instrument for airborne monitoring of N2O5, NO3, NO2 and O3 in the upper troposphere lower stratosphere
» Mr. Paul Wills, Dr. William Dubé, Dr. Andreas Zahn, Dr. Steven Brown, Prof. Andy A. Ruth

High Resolution Basemaps and Orthographic Site Images – Fast, Easy & Robust
» Dr. Richard Terres

Improving intertidal seaweed classification using UAV RGB and multispectral sensing
» Mr. Damir Akhmetshin, Dr. Leon Cavanagh, Dr. Dean Callaghan, Dr. Owen Naughton

Climate Policy & Communication Posters

Atrium, Outside Auditorium, SETU, Waterford

From the West Coast to the East: BioBeo Schools and the Circular, Sustainable and Ecological Bioeconomy
» Mr. James Lowry

Cities2030 EU project Supports Local policy initiatives in the South East region in Urban Green Space Use: An ongoing pilot study for Community Gardening Initiatives to Supplement Households and Communicate Proactive Environmental Behaviours.
» Dr. Christina O'Loughlin, Ms. Aileen Drohan, Ms. Frances Cleary, Ms. Hazel Peavoy

Continued from **Wednesday, 27 March**

ENABLE-BIO: bringing clarity to Bioeconomy regulations, to create a roadmap towards the creation of an enabling regulatory environment for the development of biobased innovations
» Mr. Robert Ludgate, Dr. Theresa Rubhara, Dr. Luke Kelleher, Dr. Eoin O'Neill, Dr. Helena Mc Mahon

Examining the Drivers that Shape Sustainable Consumer Behavioral Intentions of Regional Leisure and Visiting Friends and Relatives (VFR) Passengers in the Irish Aviation Industry.
» Ms. Amy Whelan

Biodiversity & Ecosystems posters
Atrium, Outside Auditorium, SETU, Waterford

Consequences of agricultural grassland management intensity on soil microbiome-mediated nutrient cycling potential in Ireland
» Ms. Karla Burke, Dr. Achim Schmalenberger, Dr. Stefanie Schulz, Dr. Andreas Luescher, Dr. Fiona Brennan, Dr. Aaron Fox

Effect of sward type, composition, and farming system on earthworm populations
» Mr. Seán Nagle, Prof. Helen Sheridan, Prof. Olaf Schmidt

Assessment of Ulva intestinalis (Chlorophyta) optimal growth factors under laboratory conditions
» Ms. Vanessa Nardini, Prof. Dagmar B. Stengel

Net Ecosystem CO2 Exchange From a Peatland Under Restoration
» Mr. Md Shamsuzzaman, Dr. Shane Regan, Mr. Mark O'Connor, Dr. Ultan Mc Carthy, Dr. Imelda Casey, Dr. Owen Naughton

2:30pm **Sustainable & Regenerative Agriculture Posters**
Atrium, Outside Auditorium, SETU, Waterford

Effects of plant functional group diversity on dry matter yield across three sites in Ireland
» Mr. Valerio Snichelotto, Ms. Danielle Varley, Mr. Seán Nagle, Dr. Shona Baker, Prof. Caroline Brophy, Dr. Susanne Higgins, Prof. Helen Sheridan, Dr. John Finn

Controlled Environment Agricultural Systems (CEA); future sustainability metric design and role for biodiversity regeneration.
» Mrs. Michelle Farmer

Linking the anaerobic and aerobic methods for predicting potential mineralisable nitrogen to the microbiome involved in soil organic matter turnover
» Mr. Yahaya Jebril Amanor, Dr. Nabla Kennedy, Dr. David Wall, Dr. Fiona Brennan

Identification of Irish Cattle as potential reservoirs of extended spectrum β-lactamase producing Enterobacteriaceae (ESBL), and carbapenemase producing Enterobacteriaceae (CPE)
» Ms. Mairead Quinn

Investigating the effects of glyphosate-based herbicides and their alternatives on the soil microbiome
» Ms. Sophia Couchman, Dr. Mathavan Vickneswaran, Dr. Grace Hoysted, Mr. Stephen Seaman, Mr. Dónall Flanagan, Dr. James Carolan

Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland
» Ms. Michaela Bartley

An evaluation of multispecies and grass-clover swards in a dairy grazing platform
» Ms. orla mattimoe, Dr. John Finn, Dr. Michael Dineen, Dr. Karina Pierce, Mr. Aidan Lawless, Dr. Bridget Lynch

Variations in microbial properties associated with nitrogen mineralisation are more strongly associated with season than sward type in agricultural grasslands
» Mr. Yahaya Jebril Amanor, Dr. Nabla Kennedy, Dr. David Wall, Dr. Fiona Brennan

Continued from **Wednesday, 27 March**

Soil Health & Use Posters
Atrium, Outside Auditorium, SETU, Waterford

Quantifying baseline organic carbon stocks in agricultural soils of Ireland for monitoring the impact of land use systems on soil health
» Mr. ALEX MARTIN CASTELLON MEYRAT, Dr. Lilian O'Sullivan, Dr. David Wall, Dr. Paul Holloway, Dr. Giulia Bondi

The influence of soil structure on chemical and physical mechanisms of phosphorus release
» Ms. Patti Roche, Dr. Sara Vero, Dr. John Cleary, Dr. Mary Harty

Assessing soil health across multiple land-use types in the Northwest of Ireland
» Ms. Hayley Buttimer, Dr. Shane O'Reilly, Dr. Sean Jordan, Dr. Brian Kelleher

Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland
» Ms. Michaela Bartley

2:30pm **Sustainable Energy Development Posters**
Atrium, Outside Auditorium, SETU, Waterford

Development of housing typology-based optimisation techniques for PV energy self-consumption in Irish households
» Ms. Aiza Ahmad, Dr. Evan Finegan, Dr. Niamh Power

Determining the potential for co-benefits for biodiversity conservation and renewable energy generation in solar farms in Ireland
» Mr. Sean Morris, Mr. James O'Riordan, Ms. Anita Ortega, Dr. Sarah McCormack, Dr. Jane Stout

Waste Management & Circular Economy Posters
Atrium, Outside Auditorium, SETU, Waterford

Repurposing Yard Washings with Native Duckweeds
» Mr. Cian Redmond, Prof. Marcel Jansen, Dr. Neil Coughlan

Characterization and Comparative Analysis of Brewers Spent Grain and Distillers Spent Grain: A Comprehensive Study of Compositional Properties and Protocol Efficiencies.
» Ms. Bolutito Ibikunle, Dr. Emma Smullen, Dr. Sinead Morris, Dr. John Byrne

CircBioCityWaste: Upscaling Organic Waste Streams to Fertiliser Products and Bioenergy Though Cascading Biorefinery Approach
» Mr. Shon Shiju, Mr. Patrick Quille, Dr. Eilish Broderick, Dr. Gaurav Rajauria

Exploring the use of experiential marketing and extended reality technology to support the customer learning process of sustainability policies and principles.
» Ms. Rumbidzai Gandiwa, Dr. Rose Leahy, Dr. Pio Fenton

REcycling of NUtrients to close the fertiliser CYCLE: the daughter project of ReNu2Farm works for soil nutrient sustainability in North West Europe
» Dr. Thomais Kakouli-Duarte, Dr. Kieran Germaine, Ms. Lilian Atira, Mr. Conor Geoghehan

FoodPath - Investigating behavioural interventions to reduce food waste in Irish households
» Ms. Keelin Tobin, Dr. Colum Gibson, Prof. Alberto Longo

2:30pm **Wastewater Treatment & Management Posters**
Atrium, Outside Auditorium, SETU, Waterford

Creating value from waste; a circular economy approach to seafood processing wastewater
» Alexandra Katsara, Dr. Neil Coughlan, Prof. Marcel Jansen

Continued from **Wednesday, 27 March**

Expression and functional characterization of recombinant metallothionein proteins of water lettuce (Pistia stratiotes) and water hyacinth (Eichhornia crassipes) in E. coli
» Mr. Tapiwa Nyakauru, Dr. Orla O'Donovan, Dr. Catherine O'Reilly, Dr. David O'Neill

Cultivation of high-protein plant biomass using an agri-food wastewater for a circular economy
» Ms. Jingrou Chen, Prof. Marcel Jansen, Dr. Neil Coughlan

Green Chemistry for Sustainable Development Posters
Atrium, Outside Auditorium, SETU, Waterford

Carbon emission reduction strategies for sustainable cement production
» Dr. Raja Das, Mr. Eoghan O'Donoghue, Dr. Ramesh Raghavendra

Development of greener and more sustainable lipase catalysed synthesis of carbohydrate fatty acid esters
» Mr. Abinsah Nayak, Dr. Julie Dunne, Dr. Mike Kinsella, Dr. Claire Lennon

Development and Analysis of Deep Eutectic Solvent based Formulations for Transdermal Drug Delivery of Model Therapeutics
» Mr. Joseph Anim Boadu, Prof. Helen Hughes, Dr. Ariane Perez-Gavilan, Dr. Claire Lennon

Extraction of Active Substances from Green Tea and their Incorporation into Phytosomes to Improve Stability, Bioavailability and Permeability for Diabetic Wound Healing Application
» Ms. Syeda Attiqa Tajammal, Ms. Shiau Pin Tan, Dr. Austin Coffey

"Biological degradation of synthetic plastics- Enzymes as potential catalysts for Polyethylene Terephthatlate (PET) recycling"
» Ms. Rozina Rozina, Dr. Tracey Coady

Incorporating Sustainability in Curriculum Posters
Atrium, Outside Auditorium, SETU, Waterford

An investigation into Engineering skills and values; how they contribute to global responsibility, and the UN Sustainable Development Goals.
» Mrs. Charlene Clinton

Enacting Education for Sustainable Development in Trinity: a students-as-partners approach to incorporating Sustainability into the curriculum
»Cicely Roche, Sarah-Jane Cullinane, Freddie Fallon, John Gallagher, Tom Hegarty, Felix Mexxanotte, William Reynolds, Maryam Yabo, Carlos Rocha

A Practical Toolkit Supporting Educators to Incorporate Sustainability in Third Level Curriculums
» Dr. Emer Emily Neenan, Dr. Nataliya Romanyatova, Ms. Ailish O'Brien

Land & Sea Carbon Capture Posters
Atrium, Outside Auditorium, SETU, Waterford

Photosynthetic responses of the seagrass Zostera marina to salinity and desiccation
» Dr. Claudia L. Cara Ortega, Ms. Kathleen McGonagle, Dr. Pedro Persio Beca-Carretero, Prof. Dagmar B. Stengel

Assessing the soil carbon storage and GHG emissions of grasslands using the DNDC model
» Dr. Xiaoyi Meng, Dr. Ibrahim Khalil, Prof. Bruce Osborne

Future Proofing our Forest Posters
Atrium, Outside Auditorium, SETU, Waterford

Role of Tree Diversity in Mediating Drought Effects in Forests under Elevated CO2 and Warming
» Mr. Tim Coffey, Prof. Jennifer McElwain, Dr. Grace Cott, Dr. John Devaney

Continued from **Wednesday, 27 March**

Water Quality & Health Posters
Atrium, Outside Auditorium, SETU, Waterford

Monitoring Environmental Resilience in Northern Ireland: The Importance of Legislation in Managing Wastewater Discharges Impact on the Environment
» Ms. Hayley Corbett, Dr. Brian Solan, Dr. Svetlana Tretsiakova-McNally, Prof. Pilar Fernandez-Ibanez

An investigation into the infiltration of Persistent, Mobile, and Toxic as well as very Persistent very Mobile chemicals in surface water.
» Ms. Rebecca Smith, Mr. Alexander Savelev, Dr. David O'Connor, Prof. Fiona Regan, Dr. Susan Hegarty

A Temporal Assessment of Antimicrobial Resistance in the Environment (TARE
» Ms. Julie O Donovan, Dr. Jean O'Dwyer

Environ 2024

South East Technological University Waterford

25th - 27th March 2024

34th Irish Environmental Researchers Colloquium

**"Harvest to Harbour:
Research from Soil to Sea"**

ORAL AND POSTER PRESENTATIONS

Table of Contents

Oral Submissions

5 Minute Poster Presentations

Posters

Oral Submissions

The right to a healthy environment in Ireland: where are we at after Coyne v An Bord Pleanála?

Tuesday, 26th March - 11:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Mr. Julian Suarez [1]

1. *University College Cork*

Recent legal developments suggest that Ireland is on the verge of explicitly incorporating environmental rights into its legal framework. The Joint Oireachtas Committee report issued in November 2023 recommended the Government to take 'preparatory steps' to consider a referendum on environmental rights and on rights of nature. All concerned stakeholders have started discussions about the content of such a proposal and the way it will be submitted to the public. Moreover, things at the international stage are also rapidly moving. In line with recent recognitions of the right to a healthy environment at the UN General Assembly and Human Rights Council, the Council of Europe is moving towards enshrining a protocol to the European Convention on Human Rights to that end. However, as hopeful as these developments might be, reality is that there is no recognised right to a healthy environment within the Irish jurisdiction. How did this come to be? This paper would explore the current position in Coyne v An Bord Pleanála [2023] IEHC 412, and explain why the judiciary has been so reluctant to identify a derived right to a healthy environment from the Bunreacht. The paper would seek to contribute in shedding some light on Ireland's deficit in protection of environmental rights when compared with other jurisdictions, the Courts' strict deferential view on environmental policy and law-making issues, and how that view is, in fact, is aligned with the European Court of Human Rights case law. The need for constitutional reform in order to enshrine the right to a healthy environment in Ireland, separate from other existing personal rights, would come from institutional apathy, low judicial creativity, and the particular shortfalls of an outdated Constitution.

Micro-solutions to Meta-crises

Tuesday, 26th March - 11:45: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Ruth Quinn [1]***, Dr. Natalie Delimata*** [2]

1. *Department of Civil Engineering and Construction Studies, Atlantic Technological University, Sligo, Ireland.,* ***2.*** *Department of Social Sciences, Atlantic Technological University, Sligo, Ireland.*

One of our most significant societal challenges is apathy, which can result in a lack of action to address pressing local and global environmental challenges, ultimately jeopardising the well-being of ecosystems and human societies. The concept of meta-crisis describes this problem at a global level. It details the systemic interaction of risks with the potential to cause a cascade of environmental harms and, importantly, the corresponding sense of powerlessness and apathy that results.

A central meta-crisis theme is externalisation, the exporting of local harm to distant communities that suffer the consequences or the delegation of responsibilities to external bodies expected to solve the problem, reducing local incentives and control. While this interpretation of externalisation speaks to the broader environmental aims of organisations and governments, such as the achievement of the Sustainable Development Goals or the transition to the green economy, we have developed the concept of social externalisation to describe how, instead of engaging with the local community, social connection is increasingly externalised through social media and online interaction. Not only is this social externalisation leading to feelings of loneliness among online users, but those without online access are becoming increasingly isolated.

We must, therefore, seek to internalise environmental responsibility and social connection together. To achieve this, we propose a methodology for co-creating sustainable shared spaces that increase biodiversity, effective water management, and social connectivity, addressing the complexities of the meta-crisis at a micro-level. Without such an integrated approach, we risk addressing abstract problems with obsolete solutions while ignoring communities' most pertinent issues. This research provides valuable insights for climate communication and policy to address apathy and systemic risks at both local and global levels.

Preliminary Findings from a 2023 All-Island Research Initiative on Financial Solutions to Biodiversity Loss

Tuesday, 26th March - 12:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Prof. Sheila ODonohoe [1], ***Dr. Lisa Sheehan*** [2]

1. *SETU Waterford,* ***2.*** *Queens University Belfast*

The recent Irish Citizens' Assembly on Biodiversity Loss, together with the EU's Nature Restoration Law, has brought much needed attention to the biodiversity crisis that society faces. This crisis affects all facets of life, and is deemed a threat to financial stability. Protection of the environment and natural ecosystems are key objectives of sustainable finance which itself has emerged in recent years as a potentially transformative force to tackle these issues. The purpose of this research is to explore how solutions from sustainable finance could help to preserve natural ecosystems and halt, or at least slow, biodiversity loss. A series of special themed workshops were held in Belfast, Dublin and Waterford with keynote speakers drawn from academia, financial services and policy across the island and from the UK. Our key findings illustrate the increasing awareness of biodiversity loss and its interaction with climate change but also the challenges to addressing it that are posed by its multifaceted and interdisciplinary nature. The business case for nature's positive actions and targets set at COP15 at Montreal were deemed to reinforce the need for large-scale financial instruments offering additionality to attract investors. Case studies were presented which shed light on some of the effective best practice measures helping to harness biodiversity loss. The first of these illustrated the merits of using a Biodiversity Monitor by an international bank in financing regenerative agriculture; the second capturing the establishment of the first nature-based private sector funding instrument by an Irish bank leading to the planting of native woodlands aimed at providing recreational amenities for local communities while sequestering and storing carbon and creating biodiverse new habitats. Other highlights documented the need for specialist expertise, the co-creation of solutions involving farmers, regular communication and trust building among stakeholders as crucial for addressing biodversity loss.

The Use of Science in EU Environmental Decision-Making: A Measure of Legitimacy in Environmental Regulation

Tuesday, 26th March - 12:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Ms. Rhoda Jennings [1]

1. *University College Cork*

This paper investigates the role of science and scientific evidence in EU environmental law. It examines the practical interaction and relationship between science and the formulation and application of environmental law. The research goes beyond viewing science as a component of evidence-informed policy. It explores whether, and to what extent there is a legal obligation to use scientific evidence in the formulation of EU environmental policy and legislation.

The paper examines the role attributed to science under EU Treaty law and explores the role of science as a source of legitimacy in environmental decision-making. Case studies on ambient air pollution and nature conservation legislation are explored as a means of tracing the use of science in the formulation and application of the law.

The research consolidates the exploration of the normative role of science in EU environmental legislation and policymaking, with the actual role of science, by drawing on the concept of legitimacy to develop an analytical framework. This framework is used to discuss more precisely how science is used in the formulation of legislation, and the consequences for the legitimacy of the legislation.

The research indicates that there is a wealth of high-quality science advice in the EU. Shortcomings in the regulatory structure of the science-law interface, however, serve to undermine the functional benefits of science. This has an adverse impact on the ability of EU environmental legislation to achieve its technical objectives.

Life Cycle Assessment of Harvested Wood Products for Buildings in Ireland

Tuesday, 26th March - 11:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Dr. William Horan [1], ***Mr. Song Ge*** [2], ***Dr. Patrick McGetrick*** [2], ***Dr. David Styles*** [3], ***Dr. Michael Quilligan*** [1]

1. *School of Engineering, University of Limerick, Castletroy, Limerick.,* ***2.*** *Timber Engineering Research Group, Ryan Institute, University of Galway, Galway.,* ***3.*** *School of Biological & Chemical Sciences and Ryan Institute, University of Galway, Galway.*

Harvested wood products (HWP) are increasingly being promoted by national policy makers, industry representatives and academic experts as sustainable building materials due to their ability to lock up carbon sequestered from the atmosphere for extended periods of time, coupled with the potential to substitute carbon intensive materials such as steel and concrete. Life Cycle Assessment (LCA) methodologies and benchmark limit values for whole lifecycle carbon (WLC) and other environmental impacts of buildings have already been developed by several European member states offering insights for Irish policymakers who are currently developing a national methodology for the WLC of buildings. This current study has undertaken a review of the academic literature, national and international Environmental Product Category Rules, and existing Environmental Product Declarations for wood construction products to identify common assumptions for calculating building level WLC. Combining these assumptions with Ecoinvent v.3.10 background process data adjusted for local Irish variables relating to wood density, product material composition (i.e. moisture and adhesive content), and greenhouse gas emission intensities for grid electricity and industrial heating has allowed for development of an Irish specific LCA database for primary wood products currently produced in Ireland, and prospective environmental impacts for establishment of indigenous secondary wood product industries. Preliminary findings suggest significant variation in potential storage of biogenic carbon within HWPs based on wood density values by species type and product material composition. Expanding LCA boundaries also indicates significant variation in avoided emissions from substituting carbon intensive materials with HWPs, due to assumptions relating to the types and quantities of displaced materials, and associated environmental burdens. The findings of this research provide novel insights into the sensitivity of country-specific environmental footprints for construction HWP footprints, important for refinement of Irish national building LCA methodologies and for future LCA evaluation of cascading wood value chains within the bioeconomy.

Energy efficiency intervention methodologies for buildings with historic and architectural value in Europe: A case study for Romanian heritage buildings

Tuesday, 26th March - 11:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mrs. Simona Serban [1], ***Prof. Tiberiu Catalina*** [1]

1. *Technical University of Civil Engineering Bucharest, Romania*

For European cities, villages and settlements, heritage architecture is the element that emphasizes their personality, culture and history, giving them their identifiable character: becoming recognisable symbols for the European cultural heritage, the identity of European society. However, the current existing building stock contributes greatly to greenhouse gas emissions in Europe, thus a large-scale energy optimization and regeneration for the existing heritage buildings is a key step needed to be taken towards implementing sustainable policies in European cities. It is estimated that 14% of the existing building stock in Europe was built before 1919 and 26% before 1945. In Romania, approximately 31% of the building stock dates before 1961, amassing to the current stock of buildings with historic and architectural value in the country.

The main objective of this paper is to showcase current legislative framework regarding the energy efficiency measures for heritage buildings, identify key strategies and solutions for implementing the above mentioned measures and also present a study made on a heritage building in Romania, showcasing the benefits of using structured intervention methodologies.

The article will refer to intervention methodologies as being a series of systematic, organized approaches and strategies implemented in order to generate proper energy saving solutions customized for the heritage buildings in question, taking into consideration their unique characteristics; the study, results and conclusions presented in the article, will also include DesignBuilder models. In addition, the article will also underline the importance of involving key stakeholders into the adaptive reuse processes for buildings with historic and architectural value, in order to make sure the interventions will be easily sustained throughout the building's new extended usage period.

Keywords: adaptive reuse, energy efficiency, heritage buildings, buildings with architectural and historic value, thermal comfort, heritage buildings, behavioral change, DesignBuilder, built heritage

Digital Twin for smart and sustainable cities: a comprehensive review

Tuesday, 26th March - 12:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. Bogdan Gheorghe [1]

1. *Technical University of Civil Engineering of Bucharest*

Over the past years a new concept named Digital Twin has emerged and the need for its understanding on how this digital tool can help to achieve sustainable goals throughout cities has increased significantly. This paper aims to provide the progress made for a smart and sustainable building in terms of digitalization, integrated operating systems, and artificial intelligence, through a state-of-the-art review of ongoing studies and research. Particularly, it pays attention towards the dimensions of Digital Twin, its components and implementation, revealing fresh insights to improve sustainability, resilience, and livability. The results highlight how different risks can be treated together rather than addressing them in isolation allowing communities an incredible opportunity to make buildings more efficient, more comfortable, and safer. Cities are actively using digital twins to understand stormwater maintenance, improve public transit and mobility, enhance emergency response, and analyze energy consumption patterns. However, while many are finding great value in small-scale smart city digital twin deployments, the technology has yet to be fully utilized on a full city scale. A fuller integration with data streams across infrastructure systems into a smart and sustainable city digital twin will allow large cities to access deeper insights that will enable them to better understand, predict plan form and even react to the complexities of urban living. Finally, the critical analysis of literature enhances the management importance of Digital Twin to achieve smart and sustainable cities.

Irish Tree Explorers Network – Cultivating a deep appreciation of Ireland's forests and trees through public engagement.

Tuesday, 26th March - 12:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Emma Hutchinson [1]

1. *University College Cork*

Emma Hutchinson[1,2], Eoin Lettice[1,2] , Barbara Doyle Prestwich[1,2], Claire Connolly[3], Claire Nolan[1,3], Vicky Knight[1,2]

ITEN is creating a national network of living tree collections (e.g. arboreta, forest parks, urban parks, historic sites, etc.) which will engage the general public with important STEM topics. The ITEN approach will include the development of digital STEM engagement tools which can be accessed across the network of sites by visitors, tour leaders, parents, teachers, as well as members of the community to explore STEM through the medium of a tree collection. ITEN will use an inter-disciplinary approach to engage participants with STEM topics. The project combines plant science and horticulture with the environmental humanities to maximise engagement. Learning about the cultural history of trees and how they have been used by past communities has the potential to help people think about different plant species have served humanity across time. It offers an elevated perspective not only on how much trees have enabled human survival, development and civilisation, but also on themes such as resource extraction, depletion and regeneration. In this respect, awareness of the cultural significance of trees may help to promote a sense of ecocultural identity, environmental gratitude, and greater care for woodlands today. This inter-disciplinary approach is important as we grapple with era-defining global challenges such as climate change, biodiversity loss and food insecurity. These challenges require us to recognise important links between disciplines which can push forward the dialogue around climate justice, climate change mitigation and adaptation. ITEN activities and materials will be co-created by the project team along with national-level project partners. These resources will be designed to promote STEM through the living collections and to encourage the public to consider their response to global challenges.

Keywords: arboretum, plants, trees, forests, woodlands, education, outreach, biodiversity, culture

Impacts of Weather and Human Intervention on Historical Forestry Pest Outbreaks on the Island of Ireland

Tuesday, 26th March - 12:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. Ultan O'Donnell [1], ***Dr. Conor Francis McGee*** [2], ***Dr. Jon Yearsley*** [1]

1. *University College Dublin,* ***2.*** *Department of Agriculture, Food and the Marine*

Long-term data on the presence of forestry pests can inform current pest management. By examining correlations between shifts in pest occurrences and various potential drivers, we can better inform decision-making and management strategies. However, the availability of such long-term data is often limited.

In our research, we address this issue by rescuing annual data records of forestry pest occurrences dating back to 1970. These records were systematically gathered from government annual reports from both Northern Ireland and the Republic of Ireland, resulting in a pest occurrence database for the island of Ireland.

We employ statistical modelling and analysis to explore the connections between changes in pest occurrences and potential drivers of change, including control measures, surveying effort, and weather conditions. We find that human intervention has the greatest impact on pest presence over a 5-year period. Our methodology for data collection and analysis can serve as a blueprint for other areas in biology where data is physically available but not ready for analysis.

Research Funding Supports at SEAI

Tuesday, 26th March - 11:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Irene Ward [1]

1. *Programme Manager, Research, Development and Demonstration, SEAI*

Irene Ward currently manages the RD&D programme in SEAI having joined the SEAI RDD team in 2021 as a Programme Executive. Prior to this she worked in Research Project Management roles based in UCD for national and international funded projects for 12 years. She has also held roles as a Centre Manager for in an International Centre for Mathematical Sciences at Heriot Watt and University of Edinburgh and a Community Education Manager in Cambridgeshire. Irene is committed to lifelong learning and research and has a BSc in Geography (Ulster), a PGCE (Leeds), an MSc in Management (UCD Smurfit) and is currently in the latter stages of an MSc in Environmental Sustainability (UCD).

Development of data-driven digital solutions for the predictive maintenance of hydropower plants

Tuesday, 26th March - 11:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Bhaskar Paudel [1]***, Prof. Aonghus Mc Nabola*** [1]

1. *Trinity College Dublin*

The penetration of intermittent renewable sources like solar and wind in the European energy market has increased risks to electrical grid stability. The ageing hydropower fleet in Europe is required to operate more flexibly than ever to fulfill energy demands and support the integration of stochastic sources. Consequently, hydraulic turbines are often pushed to operate in extreme off-design situations, which accelerates their susceptibility to damage, eventually leading to higher failure rates.

The operational safety and revenue of hydropower facilities are dependent on the functioning state of the turbines. Therefore, the combination of data-driven digital tools into their condition monitoring (CM) system is recognized to hold paramount importance. This research is focused on addressing the aforementioned concern, aiming to develop novel CM tools that will facilitate predictive maintenance by utilizing real-time measurements of physical parameters such as vibration, acoustics, flow, and pressure. Data will be collected over various stages to characterize good operating conditions, the initiation and evolution of damage, failure states, and post-repair conditions. The onset of failure conditions will be detected by mapping them against good operating conditions using signal processing and feature extraction methods. Condition indicators extracted from these datasets will be fed into an artificial intelligence algorithm to train machine learning models. These models will be capable of retraining themselves without human intervention, ensuring ease of operation since most powerplants nowadays are remotely supervised.

Real-world hydropower plants and lab-based experimental data will be studied and compared with the computer-based simulations. The reliability of the CM tool will be validated at various hydropower demo sites. The CM tool is expected to increase plant availability and reduce O&M costs by 5–10%, helping to increase the penetration of other renewable energy sources in the European grid.

Keywords: hydropower, condition monitoring, digitalization, data-driven techniques, artificial intelligence, machine learning

Numerical Modelling for Energy Efficiency Optimisation in Industry

Tuesday, 26th March - 12:00: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Patrick Donnellan [1], ***Mr. Arun Antony*** [1], ***Dr. Ramesh Raghavendra*** [1]

1. *South Eastern Applied Materials Research Centre (SEAM), South East Technological University, Waterford, X91TX03, IRELAND*

Numerical modelling methods such as Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) are powerful tools for the prediction of the behaviour of physical systems and processes. SEAM (South Eastern Applied Materials Research Centre) based in SETU leverages these techniques to assist industry in improving energy efficiency of operations, products, and services. Prediction and comparative analysis of energy efficiency performance metrics via numerical modelling can allow for more efficient designs or improved operating protocols to be developed by offering detailed insight into the physical processes affecting energy performance. SEAM will discuss several recent industrial consultancy projects relating to the energy performance optimisation across several industrial applications covering the following areas:

- Maximising leisure centre energy efficiency through the optimisation of spatial airflow distribution
- Performance analysis of insulated building foundation design through the analysis of transient heat flow
- Design and analysis of passive air cooling air handling unit infrastructure for data centre applications by quantifying air flow mixing performance

Digitalisation of existing hydropower plants to predictive maintenance and improved efficiency, lifetime and cost-effectiveness.

Tuesday, 26th March - 12:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Maciej Janiszkiewicz [1], ***Dr. Aonghus Mc Nabola*** [1]

1. *Trinity College Dublin*

The study aims is to improve efficiency, lifetime and digitalization of hydropower plants in Europe through comprehensive optimization.

Although hydropower is one of the most predictable sources of renewable energy, it is difficult to build new installations in Europe. They must fulfil a vast number of rigorous requirements, and finding an available spot is usually a big challenge. Taking it into consideration, there is a large demand for optimization of existing fleet to improve their efficiency, reduce downtime, increase lifetime and transparency of electricity production.

Nowadays, existing hydropower plants across Europe are often very old and lack digital solutions. To improve utilization of existing hydropower fleet, it is necessary to reduce downtime of hydro turbines and increase the lifetime. Such a target can be achieved through identification of the most common problems related to fluid dynamics of turbine. These are cavitation, silt erosion and resonance effects.

Cavitation is a phenomenon that can gradually remove material from turbine, eventually leading to its break. It happens only when certain hydrodynamical criteria are met and the role of such sensor will be to recognize and avoid them. In terms of silt erosion, the quality and quantity of silt present in the water will be monitored and used to make decision about turbine work. The same rule will be applied to vibration measured on turbine.

Kaplan, Francis and Pelton turbines from five power plants scattered over Europe are being modelled in near-failure scenarios. The objective of such modelling is to obtain data that can be utilized by AI algorithms, thereby enabling the creation of intelligent sensor. Its purpose will be to foresee upcoming failure of hydro turbine based on real-time measurements and optimize working conditions, avoiding sudden breaks of turbine rotor and decreasing the rate of its wear.

Using a large-scale electrolyser plant to improve fault resilience and reduce the DC link capacitor size in a HVDC-connected offshore wind farm

Tuesday, 26th March - 12:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Ms. Huong Le [1], ***Dr. Paul G. Leahy*** [2], ***Dr. Padraig Lyons*** [3]

1. *MaREI Centre, Environmental Research Institute, University College Cork, Cork, Ireland. School of Engineering & Architecture, College Road, University College Cork, Cork, Ireland.*, ***2.*** *School of Engineering & Architecture, College Road, University College Cork, Cork, Ireland. MaREI Centre, Environmental Research Institute, University College Cork, Cork, Ireland.*, ***3.*** *International Energy Research Centre, Tyndall National Institute, Cork, Ireland*

Wind-generated green hydrogen will be a key enabler of the transition from an energy system based on fossil fuels to one based on renewable energy. Voltage-Source Converter High-Voltage Direct Current (VSC-HVDC) transmission technology will play a major role in integrating offshore windfarms to the onshore grid due to its high efficiency. While previous studies have examined the use of VSC in electrolyser applications for offshore wind systems, none have specifically addressed the integration of large grid-connected electrolyser systems with offshore wind power plants connected to VSC based HVDC systems. Furthermore, the large size of the required DC-link capacitors and the sensitivity of grid-connected wind-hydrogen hybrid systems to grid failures need to be considered.

The study uses a current control vector, based on internal and external control loops, to control the increase or decrease of electrolyser current which is capable of managing low voltage ride through events. In addition, the control strategy manages power flows between the inverter and rectifier through the DC-link, to minimise voltage fluctuation with the support of the electrolysers, despite using only a relatively small capacitance. This approach reduces the size of DC-link capacitors, thereby cutting the cost and volume of the inverter, but also improves the reliability of DC-link dynamics with reduced capacitance. The proposed approach ensures compliance with grid codes, particularly in low-voltage ride-through scenarios, when connecting large electrolyser plants to the electrical grid using VSC-HVDC technology.

Developing pathways for a sustainable shipping and maritime fuel in Ireland

Tuesday, 26th March - 12:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Asif Tanvir Bhuiya [1], ***Dr. Nathan Gray*** [1], ***Dr. Richard O'Shea*** [1], ***Dr. David Wall*** [1], ***Prof. Jerry Murphy*** [1]

1. *Civil, Structural and Environmental Engineering, School of Engineering and Architecture, University College Cork. SFI MaREI Centre for Energy, Climate and Marine, Environmental Research Institute, University College Cork.*

Ireland must decarbonise the hard-to-abate sectors, such as heavy transport, to realise a future net-zero economy. For example, the shipping sector is currently reliant on imported fossil fuels, which are a significant source of greenhouse gas emissions. Sustainable, renewable fuel alternatives will be required going forward. As an island nation, Ireland possesses significant potential for offshore wind energy to contribute substantially to its energy requirements. The Irish government has recently set a target of achieving 5 GW of offshore wind energy by 2030. Furthermore, a target of 2 GW of green hydrogen production has been proposed. The production of green hydrogen is achieved through electrolysis supplied by renewable electricity, which will likely be sourced from offshore wind farms. Such an approach is termed Power-to-X, a technology producing an "e-fuel". It is possible to further convert the hydrogen to other fuel alternatives such as methane, methanol, and ammonia, which may be more applicable to existing shipping vessels. This study intends to provide important information on the development of such sustainable pathways for the maritime industry in Ireland. The study aims to specifically investigate the following: the fuels currently being used in the shipping sector and in what quantities; the fuels that are expected to play a role in future shipping, such as hydrogen, methanol, and ammonia; the scale at which these fuels can be produced; and the cost associated with their production.

Keywords: offshore wind energy, shipping, Power-to-X, green hydrogen, decarbonisation.

Creating an Agroforestry Module on the HOLOS-IE Digital Platform for Assessing Carbon-Neutral Agricultural Farming

Tuesday, 26th March - 11:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Mahjabin Siddique [1], ***Dr. Rem Collier*** [1], ***Mr. Badhan Sen*** [2], ***Ms. Sarah Pogue*** [3], ***Mr. Aaron Mcpherson*** [3], ***Dr. Roland Kröbel*** [3], ***Prof. Bruce Osborne*** [4], ***Mr. Cormac Farrelly*** [5], ***Dr. Ibrahim Khalil*** [4]

1. *UCD School of Computer Science, University College Dublin, Belfield, Dublin 4, Ireland,* ***2.*** *UCD School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland,* ***3.*** *Agriculture and Agri-Food Canada,* ***4.*** *UCD School of Agriculture and Food Science, University College Dublin, Belfield, D04 V1W8 Dublin, Ireland,* ***5.*** *Agriland Media, Blanchardstown Corporate Park, Dublin 15*

Agroforestry, a sustainable land management strategy, involves planting trees on land designated for crops or livestock grazing, providing diverse environmental, economic, and social benefits. By capturing and storing carbon in trees and soils, it minimises farms' environmental impact, contributing to climate change mitigation. Aligning with Climate Action Plans, the Irish/EU-focused Agroforestry module on the HOLOS-IE digital platform aims to estimate greenhouse gas (GHG) emissions, and carbon footprint, as well as optimise farmland use, promoting best practices in Agroforestry. The research involves a series of steps, starting with a Literature Review to examine existing research and the associated outputs on Agroforestry Systems. Subsequently, we identified problems with specific issues aligned with overarching goals. We collected, preprocessed, compiled, and analysed relevant data for the development of module architecture. Then, we developed an algorithm for the prediction of farm-level soil organic and biomass carbon using the Carbon Assessment Protocol (v2.0). This is to actively address the reduction of GHGs and offsetting through carbon sequestration, aligning with ecosystem services and sustainable development goals. Meanwhile, our team accomplished the significant task of discovering unique agroforestry-specific tree species, previously limited in Ireland, thereby enhancing our understanding of the local agroecosystems. Simultaneously, efforts are underway to code for estimating the carbon footprint, followed by rigorous testing and evaluating includes calibration to improve HOLOS-IE model performance. The model could provide alternative land use and management options for agroforestry to minimise the agri-environmental footprint. Additionally, it could offer users the opportunity to verify the accuracy of carbon-credit benefits associated with both existing and alternative agroforestry practices, emphasising its utility in promoting sustainable and environmentally conscious land management decisions.

This project is funded by the Science Foundation Ireland (SFI) through the Gov.IE-ECRRF (22/NCF/FD/10947). We acknowledge the collaboration with ReLive, funded by ERA-NET/DAFM in Ireland and AAFC, Canada.

Direct and legacy effects of sulphur fertilisation on microbial soil organic matter mineralisation and priming effect.

Tuesday, 26th March - 11:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Yahaya Jebril Amanor [1], ***Dr. Eric Paterson*** [2], ***Dr. Nabla Kennedy*** [3], ***Dr. David Wall*** [4], ***Dr. Fiona Brennan*** [5]

1. *Environment, Soils and Land Use, Teagasc, Johnstown Castle, Co. Wexford,* ***2.*** *Ecological Sciences, James Hutton Institute, Aderdeen, Scotland,* ***3.*** *SETU Waterford,* ***4.*** *Teagasc,* ***5.*** *Teagasc, Environment Research Centre, Johnstown Castle, Co. Wexford*

Elevated atmospheric sulphur (S) levels since the industrial revolution were associated with increases in plant available S. However, reductions in anthropogenic atmospheric emissions mandated by EU legislation have resulted in decreased soil S to levels that can retard plant growth. Thus, S management has now become an important requirement in European grasslands. However, unlike phosphorus and nitrogen, it is not exactly known whether S fertilisation causes increment (positive priming effect) or retardation (negative priming effect) of soil organic matter (SOM) mineralisation in the presence of root exudates. An incubation study was used to assess the legacy and direct impact of S fertilisation on SOM mineralisation and priming using ^{13}C glucose as a model root exudate. Fertiliser S was directly applied to soils collected from a field lysimeter trial under +S and –S legacy management and incubated for 16 days. Portions of either soils were also incubated without direct S addition. During the incubation, ^{13}C glucose was frequently applied and CO_2 samples were collected, along with partitioning of CO_2 into SOM-C and ^{13}C glucose pools. Post-incubation analyses of microbial biomass C, N and P, and enzymatic activities were also performed. S fertilisation led to changes in SOM mineralisation, and stimulated a positive priming. SOM mineralised and positive priming increased by only 1-6% and 18-20%, respectively with direct S input but by 27 and 88% in the soil with S legacy only. Direct S input stimulated 38-122% increase in microbial biomass C, but only marginal changes were observed in microbial biomass N and P pools. On the contrary, activities of β-glucosidase, N-acetyl glusaminidase and sulphatase enzymes decreased with direct S application. Overall, the results suggest that microbial SOM turnover is controlled by both legacy and direct S fertilisation and that mineral S availability can lower microbial functions and the positive priming effect.

ReNu2Cycle – Maximising Recycling Derived Fertiliser use and closing the nutrient cycle.

Tuesday, 26th March - 12:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Robert Ludgate [1], ***Dr. Niamh Power*** [1]

1. *Munster Technological University, Cork*

For sustainable agriculture, dependency on fossil-based fertiliser imports must reduce and increased use of Recycling Derived Fertilisers (RDFs) is required. EU importation of nitrogen (N), phosphorus (P) and potassium (K) fertiliser are becoming increasingly economically and environmentally unsustainable, with pricing directly linked to the cost of energy, mining, synthesis, and geopolitical developments further impacting upon these costs. Russia and Ukraine have historically been main suppliers of N, with P imports largely coming from Marocco, this exposes stakeholders, particularly farmers, to adverse economic forces outside of their control.
As part of the co-creation methodology, a workshop with stakeholders was undertaken to investigate the complex mix of economic, environmental, and social factors affecting the use of RDFs and market development to understand the driving forces from a primary producer perspective. Within a Living Lab ethos, it focused on the main theme of “What does the farming sector want from RDFs?”. A Future Triangles method was used to understand the future needs, current issues and weight of history thereby identifying future issues of relevance affecting the sector.
This methodology supplied insightful results from participants. Supply chain factors were considered important with price, economies of scale and feasibility a consistent factor arising across from the stakeholder perspectives. Attitudes towards and lack of knowledge of RDFs weighed heavily from history, with poor education in the area and unfamiliarity with new technology influencing this. This was seen to have slowed market development. Wide ranging environmental factors were considered important with biodiversity, nutrient accumulation and emissions reductions highlighted as environmental issues as being important driving forces of RDF market development. The conflicting and changing policy and legislative environment was also seen as an important aspect of future RDFs. These initial findings show the importance of this research outputs to support future RDF market development.

Plant variety and fertilizer choice affect bacterial potential to mobilize phosphorus in potato rhizospheres

Tuesday, 26th March - 12:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Tasfia Mostafa [1]***, Dr. Achim Schmalenberger*** [1]

1. *Department of Biological Sciences, School of Natural Sciences, University of Limerick*

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Current conventional farming practices for potato cropping are not sustainable and are at risk of becoming economically unviable. Under the coordination of the Interreg project ReNu2Cycle, PotatoBIO will explore the potential of recycling derived fertilizers (RDF) to fulfil the nutrient requirements for potato growth so that synthetic fertilizer can be replaced with these RDF. A pot trial with 3 potato varieties (Desire, Kerr's Pink, and Rudawa) and 3 treatments (Recycling-derived, Organic, and Mineral fertilizer) was cultivated for a period of 4 and 7 weeks. Here, the impact of two bio-based fertilizers, i) struvite and urea (SU) as well as ii) chicken manure (CM) was compared to a mineral fertilizer with superphosphate and ammonium nitrate (MF). SU fertilization resulted in significantly highest shoot biomass yield in Kerr's Pink. Kerr's Pink showed significantly highest acid phosphomonoesterase activities with SU fertilizer after 7 weeks of cultivation where alkaline phosphomonoesterase activities were significantly highest after 4 weeks of cultivation. Abundance of phytate, and phosphonate utilizing bacteria (MPN) was highest in Kerr's Pink rhizospheres with CM, but fertilizer choice results did not reach significance. Analysis of the Kerr's Pink bacterial community structure via PCR-DGGE did not show a strong treatment effect. These findings highlight that not only fertilizer choice but also variety selection has a substantial impact on potential microbial activities that are putatively beneficial for nutrient mobilization. The SU combination as a source of P and N appeared to be an effective substitute for conventional mineral fertilizer use in the pot trial.

Keywords: Recycling derived fertilizer, Plant variety, Sustainable agriculture, bacterial community structure

The Effect of Mn and S Soil Application on NUE and N Cycling in a Two Year Winter Wheat Lysimeter Experiment

Tuesday, 26th March - 12:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Saoirse Sheehy Ariff [1], ***Dr. Paul Murphy*** [2], ***Dr. Saoirse Tracy*** [3], ***Mr. David Langton*** [4]

1. *Environment and Sustainable Resource Management Section, School of Agriculture and Food Science, University College Dublin,* ***2.*** *Environment and Sustainable Resource Management Section, School of Agriculture and Food Science, University College Dublin and UCD Earth Institute, University College Dublin,* ***3.*** *Environment and Sustainable Resource Management Section, School of Agriculture and Food Science, University College Dublin + UCD Earth Institute, University College Dublin,* ***4.*** *Origin Enterprises, Citywest Business Campus, D24 DCW0, Ireland*

Current global crop yields are dependent on the use of N fertiliser. However, widespread and prolific use of N fertiliser has a significant detrimental impact on water quality and greenhouse gas emissions. To continue the operations of the current food system and stay within the planetary limits of N pollution, N use efficiency (NUE) would need to be dramatically increased. There has been little research on the role of soil micronutrients in NUE and environmental N cycling.

A two-year outdoor lysimeter experiment was conducted to test whether Mn and S application would affect winter wheat (*Triticum aestivum*; Graham variety) NUE, N pollution and crop yield. The soil used was a leptosol collected from the topsoil horizon in a long-term conventional tillage farm in southeast England. Soil properties were measured (pH, organic matter, plant available nutrients, soil texture and cation exchange capacity). Treatments of control, S (25 kg/ha) and Mn (20 kg/ha), were applied in solution to the soil at growth stage (GS) 12 in an incomplete factorial design with five replicates per treatment. The researcher applied N in solution at 0 and 300 kg/ha. Each N treatment was applied over GS30, GS31 and GS37, with half the total N applied at GS31. Each lysimeter contained three plants. Leachate was collected weekly. Monthly composite samples were measured for NH4 and Total oxidised N. Following the first growing season, N_2O and CO_2 fluxes were measured using a Photoacoustic Field Gas Monitor. Gas measurements were taken at critical management interventions (ploughing, reseeding, fertilising) and after rainfall.

Mn and S individual application did not significantly affect yield or agronomic NUE despite soil tests indicating that this soil was low in these nutrients. The N application increased yields. This presentation will discuss the experimental set-up, dry matter yield, protein yield, gas fluxes, and N leachate.

Build a Career in Cement!

Tuesday, 26th March - 14:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Brian Gilmore [1]

1. *Communications Manager, Irish Cement Limited*

Brian Gilmore studied Natural Sciences in Trinity and obtained an MSc in 1990. He has been working in the cement industry for 17 years primarily focused on engaging with local communities, regulators and the media as the industry transitions away from fossil fuel and delivers on its climate action commitments. In addition to making cement, which is essential for our modern way of life, the high temperature manufacturing process offers huge potential to meet societies circular economy and resource recovery challenges. Prior to that he spent 11 years working in the waste industry innovating and problem solving for a diverse range of clients. The goal was always to find value in waste and establish sustainable recovery and recycling options.

The upgrading of brewers' spent grain as a novel functional food ingredient

Tuesday, 26th March - 14:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Ms. Jiao Zhang [1], ***Dr. Ariane Perez-Gavilan*** [1], ***Dr. Adriana Cunha Neves*** [1]

1. *South East Technological University*

The growing global population, rising wealth, urbanization, and shifting dietary preferences all contribute to an urgent need for a more sustainable and circular protein option. Brewers' spent grain (BSG), as the largest brewing "waste" by volume, is rich in fibre (40–70%), lipids (about 10%), and protein (19–30%). This BSG-derived protein has been shown to have various valuable activities, making it a potential ingredient for upcycling into human consumption, feed, or pharmaceutical purposes. However, its main application is limited to animal feed with a maximal market value of €6/t, or alternatively, being composted, dumped, or anaerobically fermented. Moreover, due to its high moisture content (75%) and microbial load, its shelf life is no longer than 48 hours, resulting in a significant impact on the environment, land, climate, waterbody, and therefore society. A functional beverage is a drink that provides a specific health benefit in addition to hydration. It is reported that the functional beverages market is expected to grow 6.4% between 2021 and 2026 due to the rapidly growing awareness between diet and health. The current results have indicated that not only is it possible to obtain good-quality protein from BSG using cost-effective and industrially relevant methodologies, but also that those proteins/peptides exhibit health-enhancing benefits (max ACE inhibition of 73.95 ± 0.01% and max antioxidant activity of 844.63 ± 11.12 μM) as well as good techno-functionalities (including emulsion, foaming, heat stability, dispersibility, etc.). Finally, a functional value-added food product will be developed and evaluated for its acceptance and preference among potential consumers.

Overall, this project aims to broaden the potential applications of BSG by developing a protein-enriched beverage with green and sustainable technologies to improve economic benefits for industrial production, alleviate the current food insecurity issues, and achieve sustainable development goals.

Measuring Progress in the Circular Economy: the case of CMUR

Tuesday, 26th March - 14:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Jack McCarthy [1], ***Mr. Colman McCarthy*** [2], ***Dr. Carlos Pablo Siguenza*** [3], ***Dr. Colum Gibson*** [2], ***Mrs. Claire Downey*** [1], ***Mr. Gergo Suto*** [3]

1. *The Rediscovery Centre,* ***2.*** *Munster Technological University, Cork,* ***3.*** *Circle Economy*

Multiple environmental and climate crises are currently unfolding at a global scale. These include climate change, biodiversity loss, and ocean acidification. One method for improving this situation is a transition to a circular economy in which materials and products are maintained in economic circulation for as long as possible and the generation of waste is minimised. The concept of a circular economy is gaining prominence in EU policy in particular, evidenced by the adoption of the second EU-wide Circular Economy Action Plan in 2020. Well-designed indicators and metrics are needed in order to track progress toward policy goals and as a basis for policy decision-making. However, adequate measurement is beset with challenges such as availability of high quality data, accurate and consistent methodologies, and universally accepted definitions.

With these factors in mind, we undertook two analytical tasks in relation to the Circular Material Use Rate (CMUR) indicator, which was developed by Eurostat to track progress on secondary material use in EU member states. The first task involved a critical review of the CMUR metric, through which we identified the limitations of comparing CMUR scores between countries. Second, we performed a comparative analysis of data underpinning the CMUR scores of Ireland, Austria, the Netherlands, and Croatia. Through this second task, and in spite limitations, we illustrate the utility of CMUR as a starting point for more granular analyses. We conclude that such metrics should be used in conjunction with information about the specific contexts to which they relate.

Novel value chain connections for food loss and waste prevention

Tuesday, 26th March - 14:45: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Tracey O'Connor [1], ***Dr. MaryAnne Hurley*** [1], ***Ms. Aoibheann O'Brien*** [2], ***Dr. Jennifer Attard*** [1]

1. *Munster Technological University,* ***2.*** *FoodCloud*

Among primary producers, Irish fruit and vegetable farmers are particularly vulnerable to food loss and waste (FLW). Two FLW prevention interventions were trialled with these farmers, involving redistribution of edible surplus (unsaleable, edible produce at risk of going to waste) to charities and community organizations through FoodCloud, a food redistribution organization. Both interventions involved a survey of farmers about FLW on their farms, their interest in the interventions and other ways of redistributing surplus produce.

Intervention A involved farmers supplying edible surplus to FoodCloud with full compensation of production costs. Thirty-one farmers participated in the Intervention A survey, and 77% reported edible surplus. Five farmers participated in the intervention, providing 30.6 tonnes of fruit and vegetables at a cost of €0.44/kg on average. These were redistributed to 125 community organizations, providing the equivalent of 72,969 meals and avoiding 98 tonnes of greenhouse gas emissions (in CO_2 equivalent).

Intervention B involved collection of surplus apples by volunteer groups (gleaning) coordinated by FoodCloud, and pressing the apples into juice. Twelve apple growers participated in the Intervention B survey and 8% reported edible surplus. Non-commercial orchards were also contacted about their interest in hosting gleaning. Five locations were selected. Two sites were gleaned, yielding 1.3 tonnes of apples, while three were cancelled due to weather conditions (2) and volunteer availability (1). An additional 3.2 tonnes of apples were donated by: one orchard where gleaning was cancelled, a commercial apple-grower, and gleaning organization Falling Fruit. In total 2,664 litres of juice were produced at a production cost of €3.71, while 14.4 tonnes of greenhouse gas emissions were avoided (in CO_2 equivalent).

These interventions demonstrate the potential for FLW prevention from development of new value chain connections, e.g. direct connections between food redistribution organizations, charities and community groups, and fruit and vegetable farmers.

Biorefining Biowaste Digestate into Biostimulant and Soil Conditioner in a Circular Economy Context

Tuesday, 26th March - 15:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

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The residue known as digestate, generated through the process of anaerobic digestion (AD), is in effect handled through its application in agricultural land spreading. Inherent drawbacks like residual methane emissions, potential pathogen and/or heavy metal accumulation raises major concerns, alongside land bank scarcity and long-haul transport exacerbating greenhouse gas emissions. Mono-incineration for sludges derived from municipal sources has gained popularity as an alterative to AD, as some EU member states limits land application, while others bring in less stringent regulations. Bioconversion technologies like pyrolysis and hydrothermal carbonisation have revolutionised otherwise lost carbon into recoverable biochar, which tends to have diverse applications from energy to agriculture systems. Conversely, the humified organic matter within digestates represents an unexplored opportunity for extracting humic substances. Further separation to humic and fulvic acids, offers the potential to develop humic based biostimulants from this digestate. The CircBioCityWaste project explores this opportunity, wherein a once-dismissed by-product has the potential as a valuable feedstock for the extraction of humic-based biostimulants. This will occur within a cascading biorefinery approach that concurrently produces other biobased materials for sustainable agricultural systems. The work presented highlights possibilities and challenges of using municipal and industrial digestates in this biorefinery paradigm. The integration of green chemistry-based solvent and mechanical pretreatments extraction methodologies is explored to optimize process efficiency, while also addressing concerns around recoverability. Phytotoxicity via germination tests and root elongation through microphenotyping were carried as initial analyses before preceding to application dose optimisation studies in Arabidopsis. This research sheds light on humic substances as a valuable biostimulant to enhance crop production in line with sustainable and circular principles, particularly focusing on a zero-waste-solution for biowaste in the near future.

Keywords: Anaerobic digestate, humic substances, plant biostimulant, zero-waste-solution, sustainable agriculture.

How STREAM put the I into IoT

Tuesday, 26th March - 14:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. John Ronan [1], ***Mr. Hugh O'Sullivan*** [2], ***Dr. Joseph O'Mahony*** [1], ***Mr. Benyuan Yu*** [1], ***Mr. Jerry Horgan*** [1], ***Dr. Ronan Browne*** [3]

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The Sensor Technologies for Remote Environmental Aquatic Mointoring (STREAM) project was a collaboration between both sides of the Irish Sea to better understand the impact of climate change; lower the cost of estuarine and marine observation and accelerate data provision.
Beginning with the deployment of commercial sensors, STREAM also developed sensors capable of providing real-time environmental data. As part of the STREAM project, an Internet of Things infrastructure was developed and deployed within Walton Institute, SETU to collect and process this data.
Each sensor type presented unique challenges, which had to be fully understood and overcome in order to make the data available.

This presentation will explain some of the IT aspects of the project, from the design phase all the way through to implementation (at https://grafana.marinestream.eu).

Development of a novel spectroscopic sensor for fast nitrogen dioxide measurements

Tuesday, 26th March - 14:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Eibhlin Halpin [1]

1. *University College Cork*

Poor air quality can have a serious impact on public health. According to the EPA, air pollution is the cause of over 1,300 premature deaths in Ireland every year. The EPA identified particulate matter (PM) and nitrogen dioxide (**NO_2**) as priority air pollutants for Ireland. This project focuses on NO_2, which is a brown gas that is emitted into the atmosphere when fuels are burned, meaning that it is heavily **associated with transport emissions**. NO_2 produces serious health outcomes including an increased risk of cardiovascular mortality, an increased risk of lung cancer, and a 50% increased likelihood of children developing asthma.

NO_2 has high **spatial and temporal variability**, meaning that measuring personal exposure to the pollutant can be challenging. Sensors must be fast, compact, selective and sensitive. Current monitoring systems take a single point measurement, yielding poor spatial resolution, while cheaper, portable sensors do not have sufficient reliability to influence policymakers. This project aims to develop a fast, low-cost, and selective NO_2 sensor. Using a spectroscopic method based on the structure of the NO_2 absorption spectrum, we achieve good selectivity to NO_2 in real-time.
Results showing this spectroscopic technique being tested in the Irish Atmospheric Simulation Chamber (IASC) will be presented. A simple sensor design for high concentration environments will also be presented, with potential application in continuous emission monitoring.

WIBS-4+ bioaerosol sensor: an assessment of its intended-use, and an evaluation of alternative aerosol applications

Tuesday, 26th March - 14:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Dr. Jerry Hourihane Clancy [1], ***Dr. Emma Markey*** [2], ***Ms. Gemma Davis*** [1], ***Dr. Moisés Martínez Bracero*** [3], ***Dr. Roland Sarda Estéve*** [4], ***Dr. David O'Connor*** [1]

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This intensive real-time monitoring campaign was carried out over a two-month period in Saclay, a semi-urban centre, southwest of the city of Paris, France, and is an outer suburb/exurb of the city proper.

The Wideband Integrated Bioaerosol Sensor (WIBS) 4+ model was first compared to the traditional Hirst volumetric sampling method. It was evaluated for its ability to sample and detect ambient bioaerosol concentrations, namely fungal spores and pollen grains. Along with the WIBS device and the Hirst device, meteorological and pollution parameters were obtained from co-located monitoring devices at the research centre. This allowed the construction of several Multiple Linear Regression (MLR) algorithms.

For fungal spores, significant predictors of concentration were the A WIBS channel, wind from the south and south-westerly directions, and NOx emissions. For pollen grains, the WIBS 4+ additional Xenon flashlamp (distinguishing the WIBS 4 from the WIBS 4+), which allowed for the D, DE, and E WIBS channel categories, was a strong predictor of concentrations, when combined with northerly and easterly winds, and atmospheric ammonia concentrations.
Additionally, the possibility of using WIBS 4+ technology to monitor aerosols that are non-biological was evaluated. Black carbon, which does fluoresce but does not need to be of biological origin, was found to strongly correlate with BC WIBS channel particles, along with various windspeed and wind direction parameters.

The work from this campaign shows the strong bioaerosol monitoring capabilities of the WIBS technology, the benefits of the additional Xenon flashlamp, and the potential alternative and novel uses for which the device can be deployed.

Silicon Transistors as Nitrogen Dioxide Sensors

Tuesday, 26th March - 14:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Vaishali Vardhan [1]

1. *University College Cork*

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Air quality and climate change pose significant challenges, with nitrogen dioxide (NO_2) acknowledged as an air pollutant due to its adverse effects on respiratory health, contribution to particulate matter, ground-level ozone formation, environmental repercussions including acid rain, and indirect impact on climate change. This presentation explores the development of NO_2-detecting sensors utilising silicon nanowire transistors, emphasising dynamic alterations in sensor properties during NO_2 exposure across a broad mixing ratio (250 ppb to 50 ppm). Understanding the mechanisms by which the sensors detect NO_2 has been facilitated through density functional theory (DFT) calculations. Additionally, the sensors have been successfully used to detect NO_2 alongside other gases such as ammonia, sulphur dioxide, and methane through multivariate calibration.

Keywords: Silicon nanowire sensors; NO_2

A novel application of environmental impact assessments for coastal zone restoration

Tuesday, 26th March - 15:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Melissa Taylor [1], ***Dr. Shiau Pin (Graece) Tan*** [1], ***Prof. Helen Hughes*** [1]

1. *South East Technological University*

Environmental impact assessments (EIA) in the USA are used to assess and record significant impacts that may arise from engineered projects. As coastal restoration projects are exempted from EIAs and associated policies, disconnects may occur when water quality, biodiversity, and landscapes are not considered. In the Hawai'ian Island of O'ahu, invasive mangroves are eradicated without scoping and baselines demonstrating stringent approaches are needed to determine potential impacts. Three sites were selected: Kahana Beach (mangroves present), He'eia Beach (partial eradication), and Kahalu'u Beach (control site, no mangroves). Water quality tests included dissolved oxygen (DO), biochemical oxygen demand (BOD), nitrate, pH, phosphate, salinity, turbidity, and coliform. Testing was performed annually over three years and available historical data compiled over a longer timeframe. Environmental models helped determine potential changes, such as impacts, environmental gains/losses, and documenting conclusions for EIA findings. Water quality results and historical data indicated DO, nitrate, phosphate, and salinity were statistically significant showing discernible parameter variations, particularly between 2021–2023, due to further eradication at He'eia Beach. Eradication continued, but slowed, during 2020–2022 COVID restrictions. As eradication areas were smaller and removal less frequent, water quality improved over a shorter timeframe. However, 2023 eradication over larger areas showed 67% DO decrease, 81% nitrate increase, 69% phosphate increase, and a 64% salinity decrease, whereas Kahana Beach and control site levels remained fairly static. Preliminary erosion and sea level modelling demonstrated that Kahana Beach mangroves had a positive mitigation effect, but the control site and He'eia Beach provided better native biodiversity habitats. These results suggest water quality analysis and environmental modelling could provide critical information for documenting potential impacts in the EIA. Further research needs to be conducted to determine a full timeline of expected site recovery following eradication and if the EIA could be useful at other potential restoration sites.

Optimisation, Performance Modelling and Scale-up of a Bubble Column for Photosynthetic Biogas Upgrading

Tuesday, 26th March - 14:00: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Ms. Nikita Verma [1], ***Dr. David Wall*** [2], ***Dr. Archishman Bose*** [1], ***Prof. Jerry Murphy*** [2], ***Dr. Fatemeh Kavousi*** [3]

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The utilisation of renewable energy sources has become imperative in the face of global climate challenges. Anaerobic digestion is a renewable technology that generates biogas from the degradation of organic feedstocks. Removal of carbon dioxide (CO_2) from the biogas results in an end-product of biomethane, a renewable green gas which is a substitute to natural gas. Microalgae-based photosynthetic biogas upgrading is a two-stage process using bubble column reactors and photobioreactors, which provide an innovative and more circular approach to biogas upgrading (CO_2 removal) as compared to traditional biogas upgrading methods. However, there are operational challenges, particularly foaming during CO_2 absorption in the bubble column, which impact the efficiency and reliability of the process. This study seeks to provide a comprehensive overview of the underlying principles, hydrodynamics, and kinetic performance of bubble column reactors for photosynthetic biogas upgrading, with a particular focus on foaming control mechanisms. A comprehensive comparative analysis of two distinct approaches for foaming control is detailed: mechanical foaming breakers and chemical anti-foaming agents. The respective impact of both foaming control methods is evaluated with respect to bubble column performance considering factors such as mass transfer efficiency, stability, and overall process reliability. The findings of this research can contribute significantly to the enhancement of biogas upgrading using microalgae and the development of sustainable renewable energy technologies.

Integration of anaerobic digestion system with microalgae-based carbon capture and recycling to improve the process parameters in a circular bioeconomy paradigm

Tuesday, 26th March - 14:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Muhammad Nabeel Haider [1]***, Dr. Archishman Bose*** [2]***, Prof. Jerry Murphy*** [3]***, Dr. David Wall*** [3]***, Dr. Linda O'Higgins*** [4]

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Ireland plans to achieve 5.7 TWh of biomethane production by 2030 to decarbonise its natural gas grid and also increase its energy security. Biomethane is primarily generated via upgrading (CO_2-removing) of biogas from anaerobic digestion (AD) of organic feedstock. In contrast to conventional energy and cost-intensive biogas upgrading techniques, photosynthetic biogas upgrading using microalgae offers significant economic and environmental benefits by co-generating biomethane, high-value compounds, and biofertiliser in a circular bioeconomy. However, a critical challenge lies in the selection of the optimal microalgae strain, which, besides being able to grow in mixotrophic conditions, and being tolerant to high pH and CO_2 concentrations, should also grow optimally under Irish climatic conditions. For example, although *Spirulina platensis* was previously employed for this purpose, due to its temperate origins, its cultivation was found to be energy-intensive, reducing the process benefits. Selection of microalgae should also be based on the availability of high-value compounds as the target bioproducts such as carotenoids and phycobilins for food and feed applications; the market value in these products is expected to rise to €3 billion and €1 billion respectively by 2026. The sustainability of the process could be further improved by the use of the liquid fraction of the digestate (residue) from AD in place of inorganic fertilisers as nutrients for the cultivation of microalgae, while the solid fraction can be still used as a soil amender. However, a deep analysis of metabolic and energy pathways of mixotrophic cultivation needs to be evaluated, especially with regards to the development of toxins in the microalgae from cultivation on digestate followed by a comprehensive techno-economic and life cycle analysis for successful application of photosynthetic biogas upgrading at industrial scale.

Keywords: Anaerobic digestion; microalgae; biomethane; biogas upgrading; microalgae biorefinery.

Exploiting operational modes and Powdered Activated Carbon (PAC) addition for promoting syntrophic propionate oxidation during anaerobic digestion of complex organics.

Tuesday, 26th March - 14:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Mabruk Adams [1], ***Ms. Yuyin Wang*** [1], ***Mr. Bang Du*** [1], ***Dr. Indiana Olbert*** [1], ***Dr. Guangxue Wu*** [1]

1. *University of Galway*

Powdered activated carbon (PAC) positively facilitates microbial syntrophy and interspecies electron transfer during anaerobic digestion, and both are essential for process stability and efficient methanogenesis. In this study, continuous-flow reactor (CFR) and sequencing batch reactor (SBR), with and without the addition of PAC, respectively, were operated to examine their effects on system performance and methanogenic activity. CFR_{PAC} recorded both the highest methane yield (690.13 mL/L) and the maximum CH_4 production rate (28.83 mL/(L·h), while SBRs exhibited slow methanogenic rates during cycle-test. However, activity assays indicated that SBRs were beneficial for organics removal in batch experiments fed with peptone. Taxonomic and functional analysis confirmed that while CFRs were optimal for proliferating oligotrophs (e.g., *Geobacter*), SBRs were more suitable for copiotrophs (e.g., *Desulfobulbus*). Metagenomic analysis revealed acetate metabolic routes from propionate and ethanol in CFRs, whereas SBRs were unable to assist their conversion, resulting in propionate buildup. Additionally, differential effect of operational mode on front-end metabolism of peptone and glucose was observed. Furthermore, *Methanobacterium* and *Methanothrix* acclimated to the different operational conditions, while acetoclastic *Methanosarcina* and hydrogenotrophic *Methanolinea* were adapted in SBRs (5.08-13.42%) and CFRs (0.25-1.69%), respectively. Ultimately, our research sheds light on enhancing microbial syntrophy (by PAC) as well as acclimating electroactive bacteria with complex substrate as carbon source. Our findings, we believe, will immensely contribute to the design of energy efficient anaerobic digestion systems, thereby help mitigate global warming.

Cobalt selenides and composites as electrocatalysts for Water Splitting: A comparative study

Tuesday, 26th March - 14:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Ms. Gillian Collins [1], ***Prof. Carmel Breslin*** [1]

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Hydrogen, a promising energy source, can address rising energy needs while minimizing environmental impact by avoiding fossil fuel reliance. Renewable energy sources such as wind, wave and solar power can be used to generate inexpensive electricity, which we can then use to power water electrolysis1. The generated hydrogen can then be converted back into electricity by using fuel cells, leaving only water as a by-product, rendering this technology clean and devoid of harmful emissions. The electrolysis cell can be operated at normal room temperatures without the need for high pressure rectors. Current challenges in electrocatalyst limitations, particularly with expensive materials like Platinum and Ruthenium, hinder practical hydrogen production2. Investigating CoSe2 as a potential electrocatalyst, we synthesized CoSex using electrochemical and solvothermal methods, incorporating it with reduced graphene oxide (rGO) on simple electrodes. Characterization revealed commendable electrochemical attributes, including high electrochemical active surface areas (ECSA) and low overpotentials for hydrogen and oxygen evolution reactions. Despite morphological differences, both CoSex variants exhibited stability over 18 hours. This research highlights the potential of cobalt diselenides for efficient and eco-friendly hydrogen production, offering sustainable alternatives to platinum in electrolysers and contributing to a greener hydrogen economy.

References

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Conversion of ammonium (NH4+) to green hydrogen using electroactive anammox bacteria

Tuesday, 26th March - 15:00: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Masoud Ghaani [1], ***Mrs. Fateme Saadatinavaz*** [1], ***Dr. Muhammad Ali*** [1]

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Ammonium (NH^{4+}), vital for life but frequently found in excess due to human activities, contributes to wastewater contamination and ecological imbalances. Its prevalence has a substantial impact on ecosystems and energy resources, as it is a byproduct of the energy-intensive Haber-Bosch process. In Ireland, wastewater treatment facilities, handling over a million cubic meters daily, often fail to utilize energy potential of NH^{4+}. This oversight leads to significant greenhouse gas emissions and a missed opportunity for sustainable energy recovery.

Addressing this, our project pioneers the Electro-anammox process, an innovative approach leveraging anaerobic ammonium oxidizing bacteria for efficient NH^{4+} treatment. This method not only promises substantial energy savings and organic carbon reduction but also facilitates the recovery of energy-rich hydrogen gas, thereby transforming wastewater treatment from an energy-consuming to an energy-producing venture.

Experimentally, we are optimizing the Electro-anammox process by enhancing the electrode efficiency in microbial electrolysis cells. Our studies demonstrate that employing porous three-dimensional electrodes significantly increases the superficial area for the bacterial biofilm, thereby improving the NH^{4+} oxidation rates and hydrogen yield. We are further fine-tuning process parameters like NH^{4+} concentration, retention time, and electrode surface area to reactor volume ratio, aiming to develop a scalable, energy-neutral bioprocess.

This groundbreaking project, a first in Ireland and the EU, not only stands to revolutionize NH^{4+} management by converting it to green hydrogen but also positions Ireland as a leader in sustainable wastewater treatment and energy recovery, marking a significant stride towards achieving energy-neutral wastewater management.

Keywords: Resource recovery, Anaerobic ammonium oxidation, Electroactive anammox bacteria

Herbicide Resistance: a threat to Irish arable crop production

Tuesday, 26th March - 14:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Charlotte Morgan [1], ***Dr. Vijaya Bhaskar AV*** [2], ***Dr. Susanne Barth*** [2], ***Dr. Trevor R. Hodkinson*** [3]

1. *Teagasc & Trinity College Dublin,* ***2.*** *Teagasc,* ***3.*** *Trinity College Dublin*

An Atlantic climate coupled with changing farming practices are responsible for Ireland's herbicide-dependent cropping systems. As herbicide types decrease, the increase in critical weeds and evolving herbicide resistance to high-risk ACCase (grass-weed active) and/or ALS (grass/broadleaf weed active)-inhibiting modes of herbicide action, via target-site resistance (monogenic) or non-target-site resistance (polygenic), pose a significant production sustainability challenge. While in our climate grass weeds are at risk of developing resistance, broadleaf weeds like *Papaver rhoeas,* which has a biology similar to *Alopecurus myosuroides* or *Lolium multiflorum*, can rapidly evolve resistance from continuous ALS herbicide use. In 2022, two suspect *P. rhoeas* strains, which exhibited cross-resistance to recommended label rates of ALS-inhibiting herbicides mesosulfuron + iodosulfuron, metsulfuron, and thifensulfuron + tribenuron, were subjected to detailed dose-response experiments, where they were compared with a sensitive reference. Plants were sprayed at GS 14-16 (BBCH), with rates ranging from 0.25-8 times the label rate. Herbicide effectiveness was measured by estimating the effective dose rates causing 50% mortality of the treated plants (ED_{50}). Both populations exhibited strong resistance as ED_{50} values exceeded more than 8 times the label rate of all herbicides. Through comparative analysis of ALS gene sequences in resistant and sensitive populations, a single nucleotide polymorphism at position 197 resulted in amino acid replacements of Pro by Leu, His, Thr or Arg in both resistant populations. These findings suggest the need to develop integrated weed management strategies suited to our climate and cropping systems. These were the first reports of herbicide-resistant *P. rhoeas* in Ireland.

Keywords: ALS-resistance, Papaver rhoeas, target site resistance, ED_{50}

Investigation on the use of calcium alginate beads formulation for developing plant health biological product

Tuesday, 26th March - 14:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mrs. Islam Ahmed Abdelalim Darwish [1], ***Dr. Daniel Martins*** [2], ***Dr. David Ryan*** [1], ***Dr. Thomais Kakouli-Duarte*** [1]

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Both entomopathogenic nematodes (EPN) and plant growth promoting rhizobacteria (PGPR) have considerable potential as biological control agents. Two recent research studies have shown that the PGPR, *Pseudomonas* spp., are associated with the EPN *Steinernema feltiae*, and they play a role in the parasitic lifecycle of these nematodes (Ruiu et al., 2022; Ogier et al., 2020). Fundamental compatibility aspects of the interaction between an Irish strain of *S. feltiae* (SB 12[1]) and a strain of *Pseudomonas ogarae* F113 GFP have been previously investigated in enviroCORE. Based on this background, this study aims to formulate a novel biological product consisting of a combination of these two organisms. Both *S. feltiae* (SB 12[1]) and *P. ogarae* F113 GFP were cultured prior to their incorporation in calcium alginate bead formulation. Following the recent protocol of Kim et al. (2021), three different sodium alginate concentrations (0.5%, 1.5% and 3%) were tested to determine the best for both biological agents. The best results for bead formation were obtained when using 1.5% sodium alginate concentration. Various experimental factors are currently under investigation such as 1) the maximum number of infectious juveniles (IJ) of *S. feltiae* (SB 12[1]) and the number of *P. ogarae* F113 GFP cells that can be accommodated per bead, 2) determination of the best temperature for short and long term storage of the beads, testing 4° C, 10° C and 20° C and 3) observation of organismal viability and EPN infectivity within the beads at the test conditions previously described. Following these experiments, molecular communication analyses and modelling will be carried out to better understand how those biological agents interact in their novel formulation to improve their efficiency in the final biological product.

Keywords: Entomopathogenic nematodes, *Steinernema feltiae,* plant growth promoting rhizobacteria, *Pseudomonas ogarae*, calcium alginate bead, biocontrol, IPM

Farming for Soil Health: Effects of grassland agricultural management systems on the microbial diversity and functions of soils

Tuesday, 26th March - 14:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Sean Conway [1], ***Dr. Kerry Ryan*** [1], ***Dr. Aaron Fox*** [1], ***Dr. David Wall*** [1], ***Dr. Florence Abram*** [2], ***Dr. Orla O'Sullivan*** [3], ***Dr. Tim Mauchline*** [4], ***Dr. Fiona Brennan*** [1]

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Grassland soils comprise 61% of the land use in Ireland, and provide essential ecosystem services such as food provision, nutrient cycling and the maintenance of above and belowground biodiversity. Thus, preserving soil health in grasslands is crucial to maintaining ecological balance, climate resilience, and long-term agronomic sustainability. This study aimed to determine if grassland management intensity influences physicochemical and biological parameters of soil health. In the summer of 2023, three differently managed grasslands types (all n = 16), conventional derogation (170-250 kg organic N ha^{-1} yr^{-1}), organic (125 – 170 kg organic N ha^{-1} yr^{-1}) and extensive (<125 kg organic N ha^{-1} yr^{-1}) were sampled across the southern region of Ireland. Soil samples were taken at 0 – 15 and 15 – 30 cm depth (96 samples in total) and detailed management information was collected. A range of soil physiochemical parameters were measured, and the abundance of bacterial 16S genes and fungal ITS genes was measured by qPCR. Conventional grasslands were found to have significantly higher ($p<0.05$) levels of copper, magnesium and sulphur than organic and extensive grasslands but there was no significant difference in other measured nutrients. There was also no significant difference in soil organic matter levels, bulk density, water holding capacity, pH nor fungal or bacterial abundance between the systems. The difference in micronutrient levels may stem from incorporation of these compounds in chemical fertilizers used in conventional but not in organic or extensive systems. The study indicates that increased stocking levels and chemical fertiliser use does not directly impact the broader soil health parameters. However, more detailed assessment of the impact on microbial community structure and functional capacity is needed to assess the more complex ecosystem interactions.

Soil specificity of potassium dynamics in temperate grassland soils: A soil mesocosm study

Tuesday, 26th March - 14:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

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Potassium (K) is an essential element in grassland nutrition. Some soils inherently supply large quantities of K to crops without depleting labile-K pools due to their high K buffering capacity, often requiring less artificial fertiliser K (AFK) per unit yield. The apparent response in labile-K to K inputs is often relatively low yet the supply potential for crop demand is often sufficient due to K retention on the soil cation exchange complex. Conversely, other soils have lower K buffering potential, exhibiting pronounced labile-K responses to K inputs. However, this results in poor retention of labile-K, promoting K losses via leaching and luxury uptake in grassland swards. A reliable account of K supply and retention potential across a diversity of soils is needed to improve K management and agronomic recommendations to grasslands. In the present study, inherent soil physical and chemical characteristics of 23 soils were examined to ascertain their effect on soil K dynamics in an outdoor controlled-environment facility. Soils were sown with perennial ryegrass and cut intensively for two years. A range of AFK rates were used. Detailed measurements of sward dry matter (DM) production, herbage K offtakes, K losses in leachate and changes in labile-K and total soil-K fertility were taken in response to AFK. Soil cation exchange capacity (CEC) was a good indicator of AFK retention potential for supplying crops, reflected by increased yields and sward K uptake with increasing CEC. It was also indicative of leaching susceptibility. Higher CEC soils were associated with greater sward fertiliser nitrogen use efficiency. In conclusion, improved agronomic recommendations for K in grasslands through categorisation of soils based on CEC is an effective tool in improving K use efficiency and sustainable use of finite nutrient resources; however field-scale studies are required to evaluate soil K dynamics under more diverse growing conditions.

Response of moss tissue and foliar nitrogen to a nitrogen deposition (or ammonia concentration) gradient in Ireland

Tuesday, 26th March - 15:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Lorna Marcham [1], ***Dr. Thomas Cummins*** [1]

1. *School of Agriculture and Food Science, UCD, Dublin*

Deposition of ammonia and nitrogen oxides can have detrimental effects on ecosystems. Mosses accumulate nitrogen in their tissues so tissue nitrogen is used as an indicator of air pollution pressure. In order to co-locate moss tissue collection with habitat monitoring plots, a wider pool of moss species is required than previously tested. Nitrogen deposition increases foliar nitrogen in some vascular plant species, mediated through soil processes. This can influence plant health and herbivores but also could be an early indicator of slower vegetation changes.

Moss tissue was collected at 291 plots across a deposition gradient in Ireland, including 20 plots where more than one species was sampled. Vascular plant leaves were collected at 86 of the semi-natural grassland plots. Tissue nitrogen differed significantly among moss species. A Moss Enrichment Index (MEI) was calculated to calibrate between moss species. The best regression model explained only 13.77% of variation in the data. MEI did not work well to remove the effect of species in this study, which is likely because MEI is calculated from a small range of tissue N values. A solution is proposed where external values are used to calculate the MEI, but this will require international research to sample each moss species at a greater range of measured deposition.

Vascular plant C:N was better predicted by moss C:N than by modelled nitrogen deposition, which could be partly due to a disparity between modelled deposition for 5km squares and local conditions at plots of 50m radius. Precipitation and latitude were statistically significant predictors of C:N but are also both strongly correlated with nitrogen deposition in Ireland, which means some uncertainty remains as to their relative importance.

This research contributes to improvements in monitoring of nitrogen deposition effects, helping Ireland meet requirements of the EU National Emission reduction Commitments Directive (2016/2284/EU).

Plan Four Zero

Tuesday, 26th March - 16:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Gill Higgins [1]

1. *Group Head of Sustainability, Dawn Meat*

Gill Higgins graduated from Trinity College Dublin in 2004 with a B.A. in Mathematics. As an undergraduate she worked as a Care Assistant at a residential hospital for special needs and challenging behaviour, and following graduation, she worked as a teaching assistant in the TCD School of Mathematics until 2006. Gill then began an 11-year career in Corporate Banking and Finance, before undertaking the Origin Green Ambassador Programme from 2017-2019. This 2-year Masters in Business Sustainability, arranged by Bord Bia and UCD Smurfit Graduate Business School, included 15 months of industry placements and Gill worked with McDonald's Global Supply Chain and Sustainability Team and with the M&S Plan A Team, in London. Upon completion of the MSc, Gill was appointed as Group Head of Sustainability for Dawn Meats and Dunbia, and more recently in 2022 was appointed Group Sustainability Director.

Life cycle assessment of a direct air capture and storage plant in Ireland

Tuesday, 26th March - 16:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Mr. Daniel Casaban [1], ***Dr. Elena Tsalaporta*** [1]

1. *University College Cork*

Ireland is progressing towards a low carbon economy. In 2030, new policies and the implementation of technologies as for example wind turbines, electric vehicles and solar panels are expected to contribute to the country's emission reductions. However, global greenhouse gas emissions are on the rise, increasing the global temperature as well as the risks associated with it. Numerous of these emissions are related to areas that are finding difficulties to decarbonise as for example the agricultural sector, which in Ireland is one of the sectors that more emissions discharge. Therefore, international governmental bodies are emphasising the importance of the implementation of novel methods of Carbon Dioxide Removals (CDRs) such as Direct Air Capture (DAC). In order to be fully efficient, DAC needs three key elements: a reliable source of energy, a close storage capacity and a good transport infrastructure. Depleted gas fields have been explored in the past as storage points. In this study case we explored the use of the depleted gas field at Kinsale where our results found that the energy source and the distance to the storage point are the critical factors in the efficiency of the process. Yet, around of Ireland there is a theoretical capacity to store more than 90,000 MtCO2 in the closet's basins. However, to know exactly the real capacity around of Ireland, it will require a meticulous analysis of the nearest basins.

Measuring climate change vulnerability in data-scarce regions using statistical analysis in GIS

Tuesday, 26th March - 16:45: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Mr. Keegan Covey [1]

1. *Trinity College Dublin*

A climate change vulnerability index was developed with a focus on two similar but disparate endorheic dryland basins, those of the Salton Sea in the United States (Imperial County, California) and the Aral Sea in Uzbekistan (the Republic of Karakalpakstan), to explore methodologies for assessing local vulnerability when accessible data is scarce, as in the case of Karakalpakstan. First, different approaches to measuring climate change vulnerability, including the methodologies of some existing indexes, were explored. Similarities were examined between the two case areas, as well as differences between the two, and how these factors should influence vulnerability and its measurement. The methods used for calculating the index were described, including the indicators selected and how they were aggregated. Indicators included proxies for exposures (overall water risk, soil salinity, accumulated and change in precipitation, mean evapotranspiration, changes in minimum and maximum temperature); sensitivities (life expectancy, access to drinking water, population below poverty level, and asthma prevalence); and adaptive capacity (employment, education, and crop diversity). Scores were calculated using principal component analysis (PCA) in ArcGIS. Vulnerability is mapped as much higher in Karakalpakstan than Imperial County, which is primarily a function of higher poverty, lower water access, and differences in expected climate change between the two regions. The mapped index demonstrated higher vulnerability closer to the Salton Sea, suggesting a relationship between airborne pollutants off of the desiccated sea floor and vulnerability. The study concludes that this relationship could be applied to the Aral Sea Basin and other low-data regions in place of missing data, and that a public-data index may be used to evaluate local vulnerability in a data-scarce region with further research into similar relationships between geophysical and socio-environmental factors. Public data indexes can provide a means of rapid vulnerability evaluation to aid in prioritising interventions and distribution of resources.

Hidden and shallow peat in the new Irish Peat Soils Map

Tuesday, 26th March - 17:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Louis Gilet [1]***, Dr. Terry Morley*** [2]***, Dr. Raymond Flynn*** [3]***, Dr. John Connolly*** [1]

1. *Trinity College Dublin,* ***2.*** *University of Galway,* ***3.*** *Queen's University Belfast*

Over the last two centuries, Irish peatlands have been extensively modified for agriculture, forestry and peat extraction. This anthropogenic pressure has resulted in important land cover changes and converted peatlands are now "hidden" by land cover such as grasslands, croplands, forests. Some of these converted peatlands are still unknown and thus unmapped. Another reason for the uncomplete mapping of Irish degraded peat soils is that soils with a peat layer thinner than 30-45 cm have traditionally not been included, despite being particularly vulnerable to anthropogenic pressures.

The Adaptative Mapping Framework used to produce the new Irish Peat Soils Map aimed to better locate degraded peat soils. It used the concept of "Peat Associated Land Cover classes" (PALCs) to enhance our technique of finding the hidden peatlands. It also included "Peaty soils" (PS) datasets to incorporate areas considered to be underlain by shallow peat soils (≥ 10 cm and ≥ 8.6 % Organic Matter content).

The new map reveals peat to underlie 1.66 M ha of Ireland, with an overall accuracy of 84 %. Approximately 494,900 ha were located using the PALCs, i.e., almost 30 % of the total peat extent mapped. The area identified as having shallow peat soils covers ~ 192,000 ha. 65% of this fraction was also mapped as PALC and is therefore very likely to be degraded. The specific user accuracy obtained for the areas identified with PALCs and Peaty Soils (60 to 72%) confirmed their utility to refine the mapping of degraded peat soils.

Supporting a Digital Transformation in Rural Water Communities

Tuesday, 26th March - 17:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Saravanan Gurusamy [1], Ms. Katherine Hardgrave [1], Mr. Xiaoyu Wang [1], Dr. Harun Siljak [1], Dr. John Gallagher [1]

1. *Trinity College Dublin*

In rural Ireland, water communities cannot manage challenges of increased water stress due to climate change, energy security due to rising costs, and inadequate infrastructure for treatment and distribution. As paying consumers, group water schemes (GWS) across rural Ireland have an opportunity to transform how they manage and operate their water services through informed, data-driven solutions. The primary goal of this study is to provide innovative digital and technological solutions that can help improve the resilience of rural water communities through the lens of the water-energy-climate nexus. To achieve this goal, a framework of community and multi-actor engagement is required, whilst advancing intelligent and unified data management processes for water-energy-climate nexus. Digital data management can be used to develop tools and services for Irish rural communities, but this also have a market in Europe as identified. The outcome of this study will provide accessible water-energy-climate nexus data to improve access and knowledge for a range of actors (i) educating and empowering individuals in rural water communities to accelerate the just transition in rural Ireland; (ii) informing decision-making for managers and service providers of GWS for optimal system management or strategic infrastructural investment; and (iii) producing evidence for government agencies and public bodies to validate investment decisions and policy changes. The outcomes of this project will enhance the overall resilience of GWS as small communities across rural Ireland into the future.

Ability of Steinernema feltiae nematode to locate and kill Galleria mellonella larvae in sand contaminated with hexavalent chromium VI.

Tuesday, 26th March - 16:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Dr. Anique Godjo [1]***, Ms. Lucile Ansaldi*** [2]***, Dr. Stephen Boyle*** [2]***, Dr. John Byrne*** [2]***, Dr. Thomais Kakouli-Duarte*** [3]

1. *South East Technological University,* ***2.*** *South East Technological University, Department of Applied Science, enviroCORE, Kilkenny Road Campus, Carlow, R93 V960, Ireland,* ***3.*** *South East Technological University, enviroCORE, Department of Applied Science*

Hexavalent chromium (Cr VI^+) is dangerous for animals and the environment. This element occurs naturally in agricultural soils (5-250 mg/Kg) in Ireland. To understand the effects of this toxicant on soil biota, a study using the entomopathogenic nematode *Steinernema feltiae* was initiated. *Steinernema feltiae* is naturally present in Irish soil and thus was chosen to risk assess soil Cr VI^+ pollution. Using *Galleria mellonella* larvae, an Irish strain (SB 12[1]) of *S. feltiae* was cultured and studied for its host penetration and pathogenicity to *G. mellonella* in $CrVI^+$ contaminated sand. Different lengths of PVC tubes (5, 10, 15, 20 cm,) were filled with Cr VI^+ contaminated play sand (50-300 ppm, in increments of 50), with 3-fold replication. Insect mortality was recorded 3 days later. Positive control tubes received nematodes but no Cr VI^+ and negative control tubes received no nematode and no Cr. Results showed that, both distance between nematode application point anhttps://environ2024.exordo.com/submissions/newd host, and Cr VI^+ concentration, significantly affected *S. feltiae* attraction to the host. Insect mortality of 100% and 88.89% were recorded in the positive control and at 50 ppm respectively, over 5 cm. Overall, *S. feltiae* represents a good candidate organism for soil Cr VI^+ risk assessment.

Leveraging high-density air quality sensor networks for source analysis of local PM2.5 pollution

Tuesday, 26th March - 16:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Rósín Byrne [1], ***Prof. John C. Wenger*** [1], ***Dr. Stig Hellebust*** [1]

1. *Centre for Research into Atmospheric Chemistry, University College Cork*

Air quality sensors are powerful environmental monitoring tools, especially when deployed in networks across a highly populated area. They can add increased spatial and temporal resolution to air pollution monitoring, enhancing the understanding of the local variations in air pollution, at a fraction of the cost of traditional monitoring equipment. Many towns in Ireland experience significantly elevated levels of fine particulate matter ($PM_{2.5}$) during the winter months due to the use of solid fuels for home heating. During the winter heating period of 2020/2021 ((01/10/20 - 31/03/21), the $PM_{2.5}$ 24-hour mean in Cork City exceeded the WHO Global Air Quality Guideline (15 μg m^{-3}) 23 times. However, the number of exceedances can be much higher in smaller towns due to a higher prevalence of solid fuel burning and less strict legislation regarding the sale and burning of smoky fuels (pre 2022 legislation).

This study explores the use of air quality sensor networks for monitoring $PM_{2.5}$ in Ireland, and employs Fourier transform spectral analysis to reveal information about the local and non-local source contributions to $PM_{2.5}$ pollution in the study area. The findings underscore the significant variations in $PM_{2.5}$ levels across the network, further revealing the intricate landscape of localised air pollution in Irish urban areas. Furthermore, this work corroborates our previously published source contribution estimates using a different, novel technique developed on the same data. With this method, we demonstrated that the amount of $PM_{2.5}$ attributable to local sources can vary significantly within the sensor network area and local sources can account for over 50% of the total $PM_{2.5}$ burden in many locations. These insights offer valuable implications for targeted interventions and informed policymaking in addressing local pollution hotspots within urban environments and showcase the usefulness of incorporating air quality sensors into pollution monitoring strategies and infrastructure.

Calcium Peroxide and 3-Nitrooxypropanol as Feed Additives: Residual Effects on Gaseous Emissions during Cattle Slurry Storage

Tuesday, 26th March - 16:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. Benjamin Peter Macartan [1], ***Ms. Emily Roskam*** [2], ***Dr. Shaun Connolly*** [1], ***Dr. Dominika Krol*** [1], ***Prof. Thomas Curran*** [3]

1. *Teagasc Crops Environment & Land Use Programme, Johnstown Castle, Co. Wexford, Ireland,* ***2.*** *Teagasc, Animal and Bioscience Research Department, Grange, Ireland,* ***3.*** *UCD School of Biosystems and Food Engineering, University College Dublin, Belfield, Dublin 4, Ireland*

Livestock production systems, especially manure management lead to environmental issues such as emissions of greenhouse gases (GHG) and air pollutants like ammonia (NH_3). Dietary manipulations such as feed additives have shown positive results in reducing gaseous emissions when added to cattle diets during housing. Limited studies extend gaseous measurements to the manure management stage. This study therefore examined the residual effects of adding Calcium Peroxide (CaO_2) (CAP) and 3-Nitrooxypropanol (3-NOP) to cattle diets on NH_3 and GHG emissions from resultant manure during long-term storage. Animals were divided into six groups: Control (CON), CAP Low (1.35% CaO_2), CAP High (2.25% CaO_2), CAP High Pellet (2.25% CaO_2 with a pelleted coarse ration) of the overall diet, 3-NOP (75-80 mg/kg of DM) and no 3-NOP. All animals were fed a 60:40 forage to concentrate diet. Urine and faeces were collected from the animals during a feeding trial and were mixed and sieved to form a homogenous slurry in a ratio that produced a dry matter (DM) of 6%. Sub-samples were collected before the experiment for slurry characteristics analysis. 1.6 kg of the mixed slurry was then transferred to a 2 L-capacity urine container for a laboratory-scale incubation in a temperature-controlled growth chamber (temperature: 12°C; relative humidity: 76%). Each treatment was replicated five times in a randomised block design. Sampling was done thrice a week. NH_3 was sampled using a dynamic chamber technique with a photoacoustic gas analyser while the GHG emissions were measured with a static chamber technique. Temperature and pH readings were also taken every sampling day. This experiment is just finalized. Data analysis is currently ongoing. Early results indicate that CaO_2 and 3-NOP impact slurry characteristics, GHGs and NH_3 emissions from the resultant manure. The final results will be presented at the conference.

Climate Action and Adaptation

Tuesday, 26th March - 16:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Daithí Brooks [1]

1. *Climate Action Officers, Antaisce*

Daithí Brooks is a Climate Action Officer with An Taisce, based in the Southwest. He supports Climate Ambassadors to take action in their communities, and is host of the forthcoming fourth series of 'The Climate Ambassador Podcast'. He has an MSc. in Environmental Psychology, and is interested in working with the power of values and identity to create change. Daithí has diverse experience in the eNGO and Environmental Education sector in Ireland.

Emotionality and Empowerment in Sustainability Education

Tuesday, 26th March - 16:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Emer Emily Neenan [1]

1. *SETU Waterford*

Sustainability is a multi-faceted and complex topic, drawing together ecological, socio-political, economic, geographical, industrial, and other perspectives. It is a fast-moving and urgent topic, inherently connected to the climate crisis and constantly affected by cultural and technological developments. It is, furthermore, a topic that evokes strong feelings and opinions - both positive and negative - in many people, including a relatively high degree of nihilism and hopelessness amongst younger people. Taken together, all this means that it's a topic that's very difficult to teach.

This paper explores the integration of topics related to sustainability and climate change into Irish curriculums, from the perspective of educators. It discusses current conversations around sustainability and climate education in Ireland and internationally, including approaches such as rewilding the classroom and environmental empowerment through educational co-creation. The paper particularly draws from the ongoing development and delivery of a module supporting educators to integrate sustainability into their classrooms and curriculums with care and compassion for the emotions of both the learners and the educators themselves.

Learners as Problem-solvers: Experiential and Community-engaged Learning for Effective Sustainability Learning

Tuesday, 26th March - 16:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Ms. Hayette Bellakehal [1], ***Dr. Emer Emily Neenan*** [1]

1. *SETU Waterford*

Higher education institutions are urged to design sustainable curriculums, influenced by social and political concerns, industry demands, and the physical impacts of climate change. A new pedagogical teaching approach is essential for better deliverables, effective student engagement, and understanding. This paper maps a selection of teaching programs from Irish and international Higher Education Institutes, exploring how they can help students develop creativity and critical and logical reasoning which are imperative skills to face the pressing challenges of the 21st century such as biodiversity loss, inequality, and lack of natural resources. This study delves into how these educational initiatives contribute to students' development, but also how learners apply the knowledge gained within the university, economy, and broader community. The paper compares Irish Higher Education Institutes with the global community of practice. Irish and international case studies and literature are used to explore sustainability education and community engagement activities. This work explores the effectiveness of experiential learning in incorporating sustainability into higher education, fostering lifelong learning among learners who embrace these values and apply them beyond the classroom context. It posits that action-oriented learning, as opposed to traditional knowledge-oriented approaches, is instrumental in engaging learners in problem-solving for sustainability. Ultimately, this shift in approach is anticipated to cultivate a generation of critical thinkers who are capable of delivering innovative solutions to the urgent challenges of sustainability, fostering environmental consciousness and social responsibility in society, and aiding policymakers in crafting well-informed and inclusive policies.

Resources for understanding and reporting Carbon from a 'blue carbon' perspective

Tuesday, 26th March - 16:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Avery Fenton [1], ***Prof. Mark Johnson*** [1], ***Prof. Dagmar B. Stengel*** [1], ***Dr. Rachel Cave*** [1]

1. *University of Galway*

Carbon sequestering ecosystems in the marine setting are called Blue Carbon Ecosystems (BCEs). Ireland hosts two of the three globally recognised BCEs (seagrass meadows and saltmarshes) and the search is on for other potential blue carbon ecosystems (pBCEs). One of the objectives of the BlueC project is to collate existing research, find gaps in data, and present next steps in understanding the role of pBCEs in blue carbon accounting, storage, and sequestration. Here we present a requirement framework created for defining BCEs that measures pBCEs suitability based on existing research. The requirements cover qualitative and quantitative measurements of suitability, backed up by literature, publicly available and data and data available upon request, and extrapolation from implementation of geographic information systems (GIS). Findings show that blue carbon blue carbon sequestration in Irish marine settings may be greater than previously reported. The ocean has absorbed approximately 50% of anthropogenic carbon since the industrial revolution, partitioned between the water column and seabed marine ecosystems, which includes significant area occupied by pBCEs outlined in this study. Understanding the available resources is critical in the pursuit of a comprehensive assessment of blue carbon storage and filling data gaps. Data availability and the implementation of GIS systems will be the focus of this talk, including examples of usage for blue carbon research.

Assigning recreational value to a specific coastal ecosystem in a travel cost modelling context

Tuesday, 26th March - 16:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Geraldine Doolan [1], ***Prof. Stephen Hynes*** [1]

1. *Socio-Economic Marine Research Unit, J.E. Cairnes School of Business and Economics, University of Galway*

The single-site travel cost model is a method typically used to estimate the recreational value of open-access natural areas. However, when utilised at sites where multiple ecosystem types are present, the proportion of value that is generated by each ecosystem can be unclear. Natural capital accounting frameworks such as the UN's SEEA-EA require values that are ecosystem-specific, as per IUCN classification. Therefore, recreational values from single-site travel cost model may be difficult to incorporate. In this study, we value a protected coastal site using single-site travel cost model and demonstrate ways to assign a proportion of the total site value to one of the ecosystems at the site, saltmarsh. In this way, we simultaneously broaden the applicability of travel cost model results and answer the call for more research on the cultural ecosystem services of saltmarsh. Welfare estimates for the entire site range from €4.2 - €6 million per year, depending on the total number of visits. The value that can be attributed to saltmarsh ranges from €232,349 - €2.5 million, depending on the measure used and the number of visits. We underline that the approaches used here may be more or less relevant for different contexts.

Sustainable Extraction of Protein from Duckweed

Tuesday, 26th March - 16:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Jack Prendeville [1], ***Mrs. Karen Hussey*** [1], ***Ms. Laura Hinds*** [1], ***Prof. Marcel Jansen*** [2], ***Prof. Brijesh Tiwari*** [1]

1. *Teagasc,* ***2.*** *School of Biological, Earth and Environmental Sciences, University College Cork, Cork, Ireland & Environmental Research Institute, University College Cork, Cork, Ireland*

Shifting to a diet higher in plant protein has the potential to improve human health while assisting in the reduction of greenhouse gas emissions. Excessive meat consumption is placing a burden on the healthcare system and the environment. New sources of plant-based proteins are in demand, particularly non-allergenic options. At present, soy and pea-based proteins are the main sources for vegans and vegetarians, and unfortunately both are known allergens. Duckweed (Lemnaceae) is a good source of non-allergenic plant protein, and the amino profile is suitable for human consumption. In addition, it is one of the fastest growing flowering plants in the world and can grow in various climates. The plant is noteworthy for its ability to remove pollutants from wastewater by uptake of nitrogen and prosperous.

A research gap exists in relation to protein extraction from duckweed. In this study, various methods were investigated and compared to traditional chemical extraction methods. The use of novel pretreatment technologies involving high-power ultrasound were combined with eco-friendly extraction solvents. The inclusion of a pretreatment step enhanced extractability and process efficiency. So far, results have shown that these innovative techniques can provide higher or similar yields while using significantly less energy than conventional techniques. This research shows duckweed is a readily available source of protein, and the techniques investigated in this study can facilitate sustainable protein extraction. This study contributes directly to the achievement of the United Nations Sustainable Development Goals (SDGs).

Keywords:

Lemnaceae (duckweed sp.), agri-food sustainability, plant protein extraction, novel technologies, food processing.

Do pathogens and/or localised environmental factors influence growth in Irish native oysters Ostrea edulis and rock oysters Crassostrea gigas?

Tuesday, 26th March - 17:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Vivian Hlordzi [1]***, Mrs. Sharon Lynch*** [2]***, Mrs. Sarah Culloty*** [2]

1. *University College Cork, Cork, Ireland, School of Biological, Earth and Environmental Sciences,* ***2.*** *University College Cork, School of Biological, Earth and Environmental Sciences, MaREI Centre for Climate, Energy and Marine, Environmental Research Institute (ERI), University College Cork, Cork, Republic of Ireland*

Animal growth is the increase in size or weight of an organism over its lifetime, which is influenced by genetics, age, nutrition and the environment. Accelerated growth in commercial animal stocks that reach market size faster translates to increased profitability and socio-economic well-being for the communities that depend on them. In Ireland, the native oyster *Ostrea edulis* and Pacific/rock oyster *Crassostrea gigas* are cultured and fished, and contribute greatly to the Irish rural economy (~ €58m/annum). The objectives of this study were (i) to compare the growth of age cohorts of the cohabiting oyster species in three different Irish culture systems and (ii) investigate the influence of pathogens (bacteria *Vibrio* spp. and protist *Bonamia ostreae*) and environmental factors on growth. Sixty *C. gigas* and *O. edulis* were sampled monthly from March to September 2023 and from May to September /October 2023 respectively, during the peak growth period. The whole wet weight, shell weight, tissue weight and shell length of each oyster was measured and recorded. PCR of gill tissue DNA was used to screen for the pathogens. No significant difference in whole weight was observed in *C. gigas* and *O. edulis* between two of the more northern systems while there was significantly greater growth in both species in the southern system. A higher pathogen load was observed in the northern systems compared to the southern system. An increase in sea surface temperatures and salinities in the southern system resulted in a peak in *Vibrio* spp. and *B. ostreae* a month earlier when compared to the two northern systems, which would indicate a natural thermal latitudinal gradient influencing pathogen outbreak. Results from this study suggest that environmental factors (temperature and salinity) have a two-fold effect driving pathogen outbreaks, possibly resulting in the oysters diverting energy towards immune function instead of growth.

Peatland Restoration. The Bord na Mona Story

Wednesday, 27th March - 10:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Mark McCorry [1]

1. *Head of Ecology and Bog Rehabilitation, Bord Na Mona*

Mark McCorry PhD MCIEEM has been working as an ecologist within BnM for 14 years. He is now Ecology Team Manager. His main role is planning rehabilitation of BnM's cutaway bogs and developing rehabilitation plans for these sites. He currently leads a team of 9 Ecologists. Prior to joining BnM he worked as a consultant ecologist for 8 years. His PhD looked at the ecological impacts of Spartina anglica (an invasive grass) on the saltmarsh at Bull Island. He currently lives in Co. Laois and is the Botanical Society of Britain and Ireland recorder for the county along with his wife, Fiona MacGowan.

Evaluating Agri-environmental Measures for Conserving Bumblebees

Wednesday, 27th March - 10:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Ms. Lydia Thompson [1], ***Ms. Alex Hayden*** [1], ***Dr. Karina Dingerkus*** [2], ***Dr. Dara Stanley*** [1]

1. *University College Dublin,* ***2.*** *Giorria Environmental Services*

The well-documented importance of bumblebees as pollinators in temperate climates and their consistent decline due to agricultural intensification highlight the need for effective conservation measures. Intensive mowing and grazing negatively impact bumblebee populations through removal of flowers which can disrupt their food sources, with rare and endangered species being particularly vulnerable to declines in floral resource quality and quantity. In Europe, efforts to address these issues heavily rely on Agri-environmental measures, although their effectiveness has been a subject of debate for the past three decades. Recent agri-environmental measures initiatives have seen a move toward results based schemes, with the goals to achieve more tangible and measurable environmental improvements, as well as increasing flexibility for the farmers.

This study investigated the impact of delayed mowing and grazing (implemented in treatment sites) in comparison to conventional mowing and grazing practices (found in control sites) on both rare and common bumblebees, on the Mullet peninsula in NW Ireland; an area characterised by Machair, a distinctive type of coastal habitat. The study utilized a pair field design to accommodate the heterogeneous landscape of the area. Bumblebee and floral transects were walked in five fields of each condition, recording species richness and abundance, in six data collection periods over two years. Generalised linear models were used to assess differences in bumblebee and floral variables among treatment and control fields. Additionally, the study evaluated the relationship of bumblebee flower foraging behaviours to better understand the ecological dynamics of this area. Results are discussed in the context of agri-environmental scheme implementation alongside the conservation of rare and common bumblebees.

Leveraging Environmental DNA for Monitoring and Managing Irish Invasive Species

Wednesday, 27th March - 10:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Stephanie Coster [1], ***Dr. Allan McDevitt*** [2], ***Dr. Luca Mirimin*** [2]

1. *Randolph-Macon College,* ***2.*** *Atlantic Technological University, Galway*

Over the last decade, environmental DNA (eDNA) has emerged as a robust and promising tool for detecting the presence of species. eDNA methods involve capturing and amplifying trace DNA found in the environment, and this non-invasive technique allows for detection without direct observation. In this talk, we will discuss the development and deployment of two eDNA assays designed to Irish invasive species: the coypu (*Myocastor coypus*) and the alpine newt (*Ichthyosaura alpestris*). These assays offer a promising new tool for tracking, monitoring, and testing the success of eradication efforts of invasions. Moreover, these eDNA assays offer potential integration into citizen science frameworks, enhancing their applicability and scalability.

The role of effective freshwater protected areas in the restoration of freshwater biodiversity in the European Union

Wednesday, 27th March - 10:45: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Ms. Lisa Cronin [1], ***Prof. Fiona Regan*** [1], ***Prof. Frances E Lucy*** [2]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *Atlantic Technological University, Sligo*

Limited improvements in water quality alongside a plateau in freshwater biodiversity gains in the last ten years highlights the urgent freshwater biodiversity crisis in Europe. Against the backdrop of the EU Biodiversity Strategy, the Nature Restoration Law and increasing numbers of protected areas worldwide, this research examined how protected areas (PAs) are designated within the EU, and how well the EU is positioned to restore freshwater biodiversity.

The EU Biodiversity Strategy commits to establishing a larger, improved, climate resilient network of PAs. Using data from the Biodiversity Information System for Europe this research highlights the diverse, disjointed approach to PA designation across Europe with more than 427 categories of international, regional and national protected areas. National PAs make up almost 82% of PAs with more than 400 categories of these national PAs across Europe and considerable overlaps with Natura 2000 sites. In addition, there are a myriad of government departments, agencies and administrations tasked with PA designation and management across the member states, alongside insufficient structures at national level for effective, unified, cross border PA conservation collaboration.

Tickner (2020) identified six priority actions for freshwater biodiversity restoration. This research examined these priority actions against the EU Biodiversity Strategy for 2030, the EU Water Framework Directive and the EU Nature Restoration Regulation and found that the EU has adequate policies and legislation in place to effectively address all priority actions, with clearly defined goals for nature conservation and freshwater biodiversity restoration.

The EU Green infrastructure network seeks to support biodiversity and improve connectivity between PAs, however, improved policies for PA designation are required. To advance effective PA designation for freshwater conservation, this research identified factors for effective expansion of PA network and tools to aid PA design, to identify priority areas and priority species for conservation, and improve PA connectivity.

Monitoring Contaminants of Emerging Concern (CECs) in Dublin Bay: Exploring New Analytical Approaches

Wednesday, 27th March - 10:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Dr. Enrique Jacobo Diaz-Montaña [1], ***Dr. Chloe Richards*** [1], ***Dr. Brendan McHugh*** [2], ***Dr. Evin McGovern*** [2], ***Dr. Belinda Huerta*** [3], ***Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *Marine Institute,* ***3.*** *Southern Connecticut State University*

Contaminants of Emerging Concern (CECs) are a mainly created by humans and they reach the marine environment mostly directly from land-based sources, but there are cases in which they are emitted or re-mobilized in the marine environment itself. CECs are a concern because of their high levels of human usage, and the biological effects exerted on nontarget organisms. This group of compounds is being considered in the European Union in the Marine Strategy Framework Directive Descriptor 8, together with the Water Framework Directive and the Regional Sea Conventions.

Therefore, the main objective of this study was to determine and quantify existing CECs present along the Dublin coast. This objective was threefold: (i) the use of biofilm as a sampling device, considering micro and macrofouling; (ii) the determination of CECs in 8 beach locations in Dublin Bay, including a UNESCO Biosphere; (iii) and a temporal analysis of CECs in one location.

The biofilm study comprised a separate evaluation of micro and macrofouling which showed the same profile where the sunagents (avobenzone and octocrylene) presented the highest concentrations, particularly the avobenzone. Octocrylene showed significant differences between both fouling types, presenting a concentration of 0.15 ng/L in macrofouling and of 0.38 ng/L in microfouling. Thus, some compounds were equally quantified by both fouling types, but there are others that showed significant differences. The spatial analysis of CECs showed that four compounds represent the biggest proportion of the CECs determined. Two harbours presented the lowest concentration of these compounds because boat activities predominate. The temporal analysis did not show any upward ordownward trend in measured CECs during the sampling week, thus, there is a constant concentration of marine contaminants. Additionally, it is necessary to consider the possible cumulative effect on the different species that can nest or inhabit the UNESCO biosphere.

Detection and enumeration of Shiga toxin-producing Escherichia coli (STEC) serogroups and virulence factors from surface waters and private wells within the Corrib catchment, western Ireland

Wednesday, 27th March - 10:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Dr. Zina Alfahl [1], ***Dr. Louise O'Connor*** [1], ***Prof. Dearbhaile Morris*** [1], ***Ms. Anna Lineen*** [1], ***Ms. Laura Moore*** [1], ***Dr. Jean O'Dwyer*** [2], ***Prof. Paul D. Hynds*** [3], ***Dr. Liam Burke*** [1]

1. *University of Galway,* ***2.*** *University College Cork,* ***3.*** *University College Dublin*

In Ireland, the high incidence of Shiga toxin-producing *Escherichia coli* (STEC) infections has garnered attention due to their potential to result in severe health outcomes. Unregulated private groundwater sources have emerged as an important transmission route for STEC, with approximately 17% of the Irish population using private supplies. This study aimed to investigate the prevalence of STEC contaminating rivers and private wells within the Corrib catchment. Overall, 26 water samples were collected from rivers (n=5) and 78 water samples were collected from private groundwater wells (n=14) during fortnightly sampling between late-May and Mid-August 2023. Samples (100 ml) were passed through a 0.22 µm filter and buffer was added to elute captured cells. Quantitative real-time Polymerase Chain Reaction (qPCR) was used to detect and quantify the most common STEC serogroups, O157 and O26. Real-time PCR was used to detect genetic determinants of STEC virulence (*stx1*, *stx2* and *eae* genes) and specific marker genes for the clinically relevant serogroups O111, O103, O145 and O104. Overall, STEC O157 was detected in 16/26 (61.5%) river samples (mean $9.04x10^5$ copies/reaction) and 54/78 (69.2%) well samples (mean $1.35x10^5$ copies/reaction). STEC O26 was detected in 9/26 (34.6%) river samples (mean $6.43x10^5$ copies/reaction) and 21/78 (26.9%) well samples (mean $4.45x10^6$ copies/reaction). Shiga toxin gene *stx1* was detected in 61.5% river and 51.3% well samples, while *stx2* gene was detected in 53.8% river and 43.5% well samples. Virulence factor intimin gene *eae* was detected 88.5% river and 92.3% well samples. STEC serogroups O111, O103, O145 and O104 were detected in 15.4%, 7.7%, 15.4% and 19.2% river and 14.1%, 7.7%, 14.1% and 15.4% well samples, respectively. Findings indicate high detection rates of clinically relevant STEC in the Corrib catchment. These findings provide useful insights into the significance of groundwater as a human transmission pathway for STEC in Ireland.

METAL ACCUMULATION IN SEAFOOD AND FISH PRODUCTS SOLD IN NIGERIAN MARKETS

Wednesday, 27th March - 10:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mrs. CHINELO ANULIKA NZEKWE [1], ***Dr. Timothy Sullivan*** [1], ***Prof. Deborah Chapman*** [1]

1. *University College Cork*

This research examines the concentrations of selected potentially toxic metals such as Cd, Pb, Ni, Hg, V, Mn, Fe, Zn, Cr and Mg in periwinkles (*Tympanotonus fuscatus*), brackish water catfish (*Arius africanus*), Bonga fish (*Ethmalosa fimbriata*), prawns (*Macrobrachium vollenhovenii*), Crayfish (*Palaemon hastatus*), and African catfish (*Clarias gariepinus*). Samples were wet digested and metal concentrations assessed using AAS and inductively couple plasma optical emission spectroscopy (ICP-OES) in two commercial laboratories. Catfish samples analysed using AAS, had Fe ranked highest with a concentration value of 257.1 ug/g, while Cd recorded the lowest metal concentration value with a range <0.010-0.020 ug/g. about 38 % of the composite catfish samples had metal concentrations above the WHO limits. The second batch of results obtained from composite samples of fish and shellfish purchased after five months from the same three locations, and analysed using ICP-MS, had the least value of Hg 0.038 mg/kg and the highest value of Mg (4070.702 mg/kg). Zn (59.393 mg/kg), and Cr (0.79 mg/kg) were also found in analysed samples at high concentrations in comparison to Pb, Cd, Ni, Hg and V. These batch of results had concentrations of the metals generally higher in the periwinkle samples. The concentrations of Mg and Cd in all the samples were above the WHO recommendation, although periwinkle had a higher Pb value which was below WHO/FAO limits. Furthermore, Cr, Ni and Hg concentrations in all the samples were less than the recommended limits. Consumption of fish and shellfish products contaminated by metals and metalloids is of great concern because of their toxicity to both adults and children (Singh et al., 2018). Similarly, other hazardous metals may have negative health effects in humans (Al Osman et al., 2019). Consumption of these fish and shellfish over time may pose great health risks to the consumers.

Incorporating Sustainability Case Studies into the Curriculum

Wednesday, 27th March - 10:00: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Nataliya Romanyatova [1]

1. *SETU Waterford*

The SETU Strategic Plan 2023-2028, *Connecting for Impact*, sets new goals and standards for embedding sustainability into the university curriculum in a new, innovative way.

One of the university initiatives funded by SATLE in 2023 involves developing sustainability case studies to promote good sustainability work throughout the university. This includes collaboration between staff, students, industries, communities, and all university units and campuses. Pilot groups in Waterford, Carlow and Wexford were organised to work as a team on the design and development of these case studies in SETU.

The project's aim is to create a database with different types of sustainability case studies which will also be published on the university website. This will help promote a sustainable mindset and values. The eventual database will encourage the creative use of sustainability case studies in the university curriculum and the exchange of ideas and approaches between different schools and faculties. The case studies will also be part of the Sustainability Toolkit for SETU staff.

The process of creating and developing case studies includes various stages. There are different types of case studies, including those focused on successful teaching and learning examples and those that refer to overall sustainability practices across the university. The case studies also differ in the types of collaboration presented in them.

The collaborative nature of creating and incorporating the Sustainability case studies process into the curriculum encourages staff and students to take an active part in the design. This may eventually also support the development of digital literacy around the university and promote additional opportunities for everyone for self-development and digital upskilling.

Keywords: case study, sustainability, curriculum, digital, design, collaboration

A conceptual National Framework of Qualifications taxonomy for academics using Transformative Sustainability Learning

Wednesday, 27th March - 10:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Paul O'Leary [1]

1. *SETU Waterford*

Higher Education in Ireland widely deploys constructive alignment where learning and assessment confirm the attainment of module learning outcomes (MLOs). MLOs in turn are broadly based on Blooms Cognitive Taxonomy of Learning, one of three complementary taxonomies proposed by Bloom. While it is possible to amend current HE curricula to embrace SDGs by simple MLO adjustments, it has been widely argued that greater sustainability education success requires engagement not alone from an intellectual perspective, but, for real, long-lasting impact, also requires engagement from an emotional and a practical perspective. This approach is more colloquially known as the Head-Hands-Heart model of education and is regarded as a key component to the success of transformative sustainability learning (TSL).

Higher Education in Ireland is also hierarchical in nature, offering taught programmes from NFQ levels 6 to 9 (equivalent to EQF levels 5 to 7). Moreover, academics have routinely deployed a hierarchical lexicon of action verbs, created with Blooms Cognitive Taxonomy in mind, to describe MLOs, which in turn contribute to the achievement of each of these different NFQ award levels.

This work presents a novel, conceptual taxonomy model, with MLO examples, based on TSL, that maps to the existing NFQ levels. In so doing, it addresses a gap in the resources available to academics who wish to introduce ESD into their teaching and want to consider the deeper, broader approach of TSL, than a simple, narrow approach of SDG-inspired MLO amendment.

Keywords: Transformative Learning, Transformative Sustainability Learning, Quality Frameworks

How do we embed sustainability into higher education – a conversation with stakeholder?

Wednesday, 27th March - 10:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Niamh Power [1]***, Dr. Tom Farrelly*** [2]

1. *Department of Civil, Structural & Environmental Engineering, Munster Technological University, Cork,* ***2.*** *Department of Social Sciences, Munster Technological University, Tralee, Kerry.*

Sustainable Development as a concept can trace its roots back to 1972 to the UN Conference on Human Environment. However, since then it has gathered momentum and evolved with each generation from the Brundtland Report in the 80s, to the Earth Summit (90's), Millennium Development Goals (2000's) and the current incarnation the United Nations Sustainable Development Goal (UN SDGs). For each generation the goals have become more wide reaching and inclusive. This momentum for change is fuelled in part by the deterioration in the overall health of the planet. In 2019, Ireland became just the 2nd Country in the world to declare a climate and biodiversity emergency. However, for real, effective and lasting change to come about, education for sustainable development is a vital component. Therefore, Higher Education Institutes plays a vital role in shaping our future but until sustainable development is embedded within higher education, can there ever be lasting change? Or will the UN SDGs be a flash in the pan?

The main difference between the UN SDGs and its previous incarnations is two-fold. One, the UN SDGs have caught people's imagination more that their predecessor and two the need for them has never been greater. Conversations on sustainability in higher education settings are becoming increasingly more common; however, translating dialogue into tangible action poses a challenge.

One technique is to use the Future Triangles method to engage with stakeholder to help influence university policy (Inayatullah, 2008). Through a workshop, this methodology examines where stakeholders want to be in the future, observes what is holding the process back and identifies current motivating forces, to ascertain issues of relevance for the future. The outcome of the process provides a stakeholder perspective on embedding the UN SDGs.

References

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The Detection of Contaminants of Emerging Concern, Bifenthrin, Estrone, and Diclofenac using SPE and HPLC-UV methods.

Wednesday, 27th March - 10:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Jodie Bermingham [1], ***Dr. Caroline Murphy*** [2], ***Dr. Chloe Richards*** [1], ***Dr. Belinda Huerta*** [1], ***Dr. Dylan O'Flynn*** [1], ***Dr. Ciprian Briciu-Burghina*** [1], ***Dr. Enrique Jacobo Diaz-Montaña*** [1], ***Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *School of Biotechnology, Dublin City University*

Pesticides, hormones, and pharmaceuticals are contaminants of emerging concern that can be found in environmental samples, such as marine water. Bifenthrin (BF) is an example, which easily binds to soil particles, causing residues to be carried into the environment. The toxicity of BF to non-target organisms is of most concern, highly toxic to fin-fish and crustaceans. Low concentrations of BF have also been shown to cause behavioural effects in fish, raising concerns of neurotoxic properties in fish species, impacting the ability to forage and escape from predators. Other contaminants that are found in aquatic environments are hormones and pharmaceuticals, such as estrone and diclofenac, respectively, that do not easily breakdown in the environment.

It is necessary to improve methods to extract and detect these chemicals. This research focuses on the optimisation of solid-phase extraction (SPE) coupled with high-performance liquid chromatography-ultraviolet detection (HPLC-UV). Due to the low concentrations at which these are found, the analytes must be pre-concentrated and extracted before they can be detected using HPLC-UV. This project focuses on the optimisation of the extraction and detection of these contaminants.

Oasis HLB 6cc 200 mg extraction cartridges were used for SPE. An Agilent HPLC instrument was used for HPLC-UV analysis. The column used was a Zorbax SB-C18 4.6x150 mm 5 µm LC column. A diode-array detector and varied-wavelength detector were used in succession as the detectors.

BF was detected in a concentration range of 0.065-0.079 ng/L among water samples. Estrone and diclofenac were not measured in these samples, further investigations will be carried out for these analytes. The concentrations detected may not be fatal, but repeated exposure could have damaging effects for aquatic wildlife.

To preserve marine environments it is necessary to monitor the levels of pollution in marine waters. This method will enable the extraction and detection of contaminants.

Microplastic Detection in Drinking Water

Wednesday, 27th March - 10:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Dr. Junli Xu [1]

1. *University College Dublin*

Humans are exposed to microplastics (MPs) via oral intake, inhalation, dermal contact and injection, suggesting potential risks to human health. This study aims to employ cutting-edge optical photothermal infrared spectroscopy (O-PTIR) to measure microplastic contamination in drinking water. Bottled water samples from multiple brands were procured from a local supermarket, and tap water from households was collected and transferred to the laboratory in glassware. After filtration using an aluminum oxide membrane, particles enriched on the filter were subjected to O-PTIR scanning, enabling the characterization of both spectroscopic profiles and morphological features from the obtained images. The results revealed a significant presence of microplastics in the analyzed drinking water. This research not only contributes valuable insights into the prevalence of microplastics in water sources but also underscores the urgent need for comprehensive measures to address and mitigate potential risks to human health associated with microplastic exposure through drinking water consumption.

The Detection of Poly- and Perfluoroalkyl Substances (PFAS) in Transitional and Marine Water – a Dublin Bay study

Wednesday, 27th March - 10:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Helen Burke [1], ***Dr. Belinda Huerta*** [1], ***Dr. Enrique Jacobo Diaz-Montaña*** [1], ***Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University*

Poly- and perfluoroalkyl substances(PFAS) are a large group of compounds consisting of a partially or fully fluorinated carbon chain. PFAS are used across industries including electronic and pharmaceutical manufacturing, and in firefighting foams. PFAS are now ubiquitous in the environment showing bioaccumulation and adverse health effects in wildlife and humans. Little information on PFAS concentration in Ireland's marine environment exists.

The objective of this study was to determine PFAS concentration in transitional and marine waters along Dublin Bay and pinpoint areas where the existing concentration of these compounds, or slight increases could pose an environmental problem.

Marine samples were treated with sodium thiosulfate to reduce free chlorine prior to analysis. Water samples were extracted by solid phase extraction(SPE) using Oasis WAX(500 mg). Extracts were analysed by High-Performance Liquid Chromatography-Mass Spectrometry(HPLC-MS) using a Zorbax Eclipse Plus C18 column(3.0x50 mm; 18µm).

Results confirm the presence of both legacy and novel PFAS in transitional waters entering Dublin Bay, with fluctuations in concentrations observed in upper and lower estuary sites along the River Liffey.

The highest concentrations detected were 1393.7 and 1217.9 ng/l at upper estuary sites for perfluorooctanoate (PFOA) and perfluoroundecanoate(PFUdA) respectively. Levels of PFOA decreased from upper to lower stream sites with a concentration of 57.7 ng/l at the final sampling site in Dublin Bay. Perfluoropropoxypropanoic acid(GenX) was detected at upper estuary sites with the highest concentration of 37.8 ng/l, this decreased downstream at lower estuary sites to <25 ng/l.

Two sampling sites were located upstream and downstream of Ringsend wastewater treatment plant(WWTP). Five analytes detected here were found to increase downstream of the WWTP, including GenX which increased from 18.8 to 23.9 ng/l, and perfluorohexanoic acid which increased from 95.8 to 157.9 ng/l downstream of the WWTP. PFUdA concentration was found to decrease from 1066.3 to 582.7 ng/l between these sites.

Emerging ocean contaminant sensing using antibody-based optical detection technologies

Wednesday, 27th March - 10:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Dr. Caroline Murphy [1], ***Dr. Sean Power*** [2], ***Dr. Weili Guo*** [1], ***Dr. Louis Free*** [2], ***Dr. Chloe Richards*** [2], ***Dr. Ciprian Briciu*** [2], ***Prof. Anne Parle-McDermott*** [1], ***Prof. Fiona Regan*** [2]

1. *School of Biotechnology, Dublin City University,* ***2.*** *School of Chemical Sciences, Dublin City University*

Contaminants of emerging concern have been highlighted due to their environmental persistence and detrimental impacts on non-targeted aquatic species including shellfish and finfish. Emerging contaminants such as pharmaceuticals, synthetic hormones, pesticides, and industrial chemicals find their way into freshwater streams, rivers and lakes and eventually make their way to the oceans. Along the way these dangerous chemicals impact the physiological processes of non-targeted aquatic species, causing serious biological damage as they enter food-webs.

The work described herein, involves the development of *in-situ* antibody-based monitoring systems and the concomitant development of detection and read-out technologies for the identification and monitoring of emerging contaminants of concern. Of interest are pharmaceutical non-steroidal anti-inflammatory drug diclofenac and insecticide bifenthrin, which are both biologically active compounds that exert various effects on physiological and biochemical pathways in targeted and particularly non-targeted organisms when released negligently into watercourses.

The methods used in this project involved the development of fluorescence-based competitive immunoassays towards diclofenac and bifenthrin. Transfer of optimised immunoassays from 96-well plates to lab-on-chip sensors who's out-puts could be detected on an in-house developed fluorescence reader. Validation of the lab-on-chip system was carried out using artificial seawater.

By affording the routing monitoring of oceans and freshwater courses, effective mitigation strategies can be put in place to minimise dangers to fish and to human health.

Keywords: antibody, emerging contaminants, environmental monitoring, immunoassay, bifenthrin, diclofenac, insecticide, fish and shellfish

Prevalence and diversity of plant parasitic nematodes in the Irish peatlands

Wednesday, 27th March - 11:45: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Anusha Pulavarty [1], ***Mr. Tilman Klappauf*** [2], ***Dr. Douglas McMillan*** [3], ***Dr. Thomais Kakouli-Duarte*** [2]

1. *Molecular Ecology and Nematode Research Group, enviroCORE, Department of Applied Science, South East Technological University, Kilkenny Road, Carlow1,* ***2.*** *Molecular Ecology and Nematode Research Group, enviroCORE, Department of Applied Science, South East Technological University, Kilkenny Road, Carlow,* ***3.*** *Green Restoration Ireland Cooperative Society Ltd (GRI), Ireland*

The abundance of plant parasitic nematodes (PPN) in the Irish peatlands has been investigated in eight different bog habitats. These habitats have been categorized as 'healthy' bog hummock (HBH), 'healthy' bog lawn (HBL), degraded bog hummock (DBH), degraded bog lawn (DBL), wasted peat (WP), rough grazing (RG), cutover scrub (rewetted) (C-RW) and cutover scrub (non rewetted) (C-NRW). The peat soil samples were all collected between July and December 2023, from the top 10-20 cm of the soil/benthos horizon. Each habitat had three composite replicates with each composite replicate having three sub-samples in it. Every composite replicate was divided into two parts, one part was used for molecular analysis and the other part for morphological identification of nematodes. For the morphological identification a specific extraction protocol was optimised, and the extracted nematodes were fixed onto the slides to be studied under a high power light microscope. Simultaneously, the other part of the soil was processed to isolate total DNA which was sent for sequencing (Novogene Ltd., UK) of the 18S rRNA gene and identification of nematode taxa. The extracted DNA was also used for Randomly Amplified Polymorphic DNA (RAPD) analysis to determine banding patterns that could classify different bog habitats based on PPN random primers. Plant parasitic nematodes belonging to the family Pratylenchidae and Neotylenchidae were found to be very prevalent in most of the bog habitats. However, when compared to the healthy bogs and the wasted peat, these PPN were particularly abundant in the degraded bog habitats. Heathers which were abundant in the DBL and DBH habitats, might be the hosts for these PPN. The results indicate that nematode populations vary significantly across the various bog habitats. Future actions for PPN management may need to be considered based on the possibility that these PPN might be impacting crop yields.

Boom-Bust dynamics in native and non-native mussel species and their hybrid crosses in Irish near shore environments over two decades.

Wednesday, 27th March - 12:00: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Mrs. Dulani Wickramanayaka [1], ***Mrs. Sharon Lynch*** [2], ***Mrs. Sarah Culloty*** [1]

1. *University College Cork, Cork, Ireland,* ***2.*** *University College Cork*

Globally, mussels belonging to the Genus *Mytilus* are a significant ecological and commercial species of nearshore marine habitats. Along the southern, western and northern coasts of Ireland, intertidal mussel populations consist of the native blue mussel *Mytilus edulis*, the non-native Mediterranean mussel *Mytilus galloprovincialis* and hybrids of both parent species. Studies from the 1970s to date have documented the expansion and "northward creep" of *M. galloprovincialis* in Europe and predict this trend will continue with climate change. Molecular identification (PCR) is required as both *Mytilus* spp. and their hybrid offspring cannot be differentiated morphologically. The objectives of this study were to revisit 16 mussel populations (n=471), most of which were investigated intermittently in two historical studies from May 2003 to the current study from March 2023 to August 2023 and determine species distribution and abundance (%). In the oldest study (May 2003 to February 2006), *M. galloprovincialis* was the dominant species, however in the subsequent study (June 2010 to November 2017), *M. edulis* was dominant. In the current study, findings indicate that *M. galloprovincialis* is once again dominant. These results indicate that mussel species/hybrid diversity and abundance remain stable at two Irish sites, and that a "Boom-Bust" dynamic exists at eight sites. In Lough Hyne, a marine nature reserve, hybrids have dominated from June 2013 to April 2017 and April 2023. This instability of species composition and abundance may be due to natural phenomena, in particular driven by the natural climatic events such as the Atlantic Multidecadal Oscillation (AMO) or natural fluctuations in both native and non-native populations and adaptation to localized environmental parameters. What is evident is that although the non-native species may "disappear" during particular years and for prolonged periods of time where it was once established, hybrids still remain and *M. galloprovincialis* reemerge to dominate.

Mytilus edulis

Risk perceptions of outdoor professionals and recreationists relating to Lyme borreliosis in Ireland

Wednesday, 27th March - 12:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Oral

Dr. Ríona Walsh [1], ***Prof. Mike Gormally*** [1], ***Dr. Christopher Williams*** [2], ***Dr. Caitríona Carlin*** [1]

1. *University of Galway,* ***2.*** *Liverpool John Moores University*

Lyme borreliosis (LB) is caused by bacteria of the *Borrelia burgdorferi s.l.* complex. It is the most common tick-borne disease in Europe. Those whose professions or recreational activities bring them into tick habitats are most at-risk, but there are currently no data available on the prevalence of LB in at-risk individuals in Ireland. However, at-risk individuals who perceive the presence of risk, and have knowledge relating to LB, are able to take risk mitigating measures or seek early medical treatment, thus avoiding the worst effects of LB infection. This study involved the development of a 15-question anonymous questionnaire to gather information from at-risk individuals in Ireland. Questions were designed to gather data on demographic and geographic information, risk-perceptions, training, and objective disease-related knowledge.

443 responses were analysed with 166 (37%) responses from outdoor professionals and 277 (63%) from recreationists. The overall median perceived risk amongst respondents was 3.5/5 (i.e. moderate risk). Interestingly, there was no difference in perceived risk between counties or provinces in Ireland, which is in contrast with data showing regional differences in LB risk in Ireland. When asked to rate their training on a 5-point likert scale, respondents gave median answers indicating very little training or no training. Where training was received, higher reported training levels were associated with high proportions of respondents correctly identifying high risk habitats ($p=0.003$, $T=8.876$), and describing LB symptoms ($p=0.08$, $T=7.007$).

This study has identified the perceptions of LB amongst at-risk individuals, which can be used to inform future targeted disease awareness campaigns. The study highlighted an overall need for more training for at-risk individuals in Ireland on LB disease risk. Increasing training and disease awareness around LB would ensure that individuals can enjoy working or spending recreational time in habitats that carry tick-bite risk, without increasing LB disease prevalence in Ireland.

Improving water quality using low-cost waste materials

Wednesday, 27th March - 11:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Brakemi Egbedi [1], ***Dr. Mike Kinsella*** [1], ***Dr. Shiau Pin (Graece) Tan*** [1], ***Prof. Helen Hughes*** [1]

1. *SETU Waterford*

Contaminants such as excessive nutrients and bacteria negatively affect water quality. This in turn threatens public health, food security and economic growth. To create a circular economic model for the shellfish-processing sector where large portions of shells are generated, there is an urgent need to utilize these waste products for environmental application and wealth creation. The overarching research question is 'Can these shell waste be an untapped resource for the removal of contaminants such as phosphate (nutrient) and bacteria in wastewater?' This study aimed at utilizing heat-treated forms of shell waste powder for the removal of bacteria and phosphate from synthetic and industrial wastewater. The shells were calcined at different temperatures (750-1000□) and the antibacterial activity against *E. coli* was evaluated using well diffusion assay. Using a Central Composite Design (CCD)-response surface method, the phosphate removal efficiency of the shells were evaluated using synthetic wastewater. To ascertain the efficiency of the shells in real-time scenarios, a static column study using industrial wastewater was conducted. The result of the antibacterial study showed that calcination temperature has a direct influence on the antibacterial activity since the shells calcined at 750 □ showed a 0 mm zone of inhibition while there was no statistically significant difference between the zones of inhibition exhibited by the shells calcined at 875 and 1000 □ respectively. The phosphate removal efficiency of the shells at all temperatures selected was too fast to allow for CCD data modelling. In a static column, the shells were able to remove >90% of the phosphate contained in industrial wastewater within 3h 15 minutes of application. This study showed that a low-cost water treatment option could be developed using calcined seashells. This would ensure their sustainable use and ensure the triple benefit of the circular economy model, namely people, planet, and profit.

Hydrothermal carbonization or low-temperature pyrolysis – which is better for nutrient recovery from dairy processing sludges?

Wednesday, 27th March - 12:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Ms. Anna Kaskova [1], ***Dr. Marzena Kwapinska*** [2], ***Dr. Witold Kwapinski*** [3], ***Dr. James J Leahy*** [3]

1. *Department of Chemical Sciences, University of Limerick,* ***2.*** *Dairy Processing Technology Centre, University of Limerick,* ***3.*** *Department of Chemical Sciences, Bernal Institute, University of Limerick*

Sludge from wastewater treatment is used as fertilizer (bio-solids), but it must be stored for most of the year as its application is limited to the growing season. We are looking at alternative ways of concentrating nutrients in an easy-to-store and transportable form.

The effectiveness of hydrothermal carbonization (HTC) and low-temperature pyrolysis (LTP) at different process conditions for macro- and micro-nutrient recovery in solid products (hydro-char and bio-char, respectively) was studied on two samples of dairy processing sludge (DPS). Both dairy sludge samples contained similar concentrations of N, P, K, Mg, Na, with one sludge having significantly higher Ca content (62.2 versus 16.1 g/kg).

For both sludges, HTC led to the retention of P and Ca (90-100%) in hydro-chars. Mg retention varied between samples, it was over 87% for DPS1 and over 66% for DPS2. The recovery of K and Na was 25-50%, N recovery was in the range from 32 to 61%, and the recovery rates for N, K, Na were the lowest at the highest process temperature and longest residence time.

For bio-chars P, Ca, Mg, K, Na recovery was in the range of 82 to 100%. The N recovery lay in the range of 27-73%, higher temperatures had a significant negative impact on its recovery.

Plant-available P concentration increased after HTC and LTP, with the highest concentration in hydro-chars produced at 220°C, and bio-chars produced at 550°C. However, the percent of total P which is plant-available slightly decreased with harsher processes conditions. Maximum percent of plant-available P was achieved at 180°C and 350°C for both sludges.

LTP, overall, provides better recovery of nutrients due to the retention of K and Na. However, both treatment processes concentrate P and Ca. The results of this research can provide an alternative treatment for DPS and potential bio-char usage in agriculture.

Expression and functional characterization of recombinant metallothionein proteins of water lettuce (Pistia stratiotes) and water hyacinth (Eichhornia crassipes) in E. coli

Wednesday, 27th March - 12:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. Tapiwa Nyakauru [1], ***Dr. Orla O'Donovan*** [1], ***Dr. Catherine O'Reilly*** [1], ***Dr. David O'Neill*** [1]

1. *South East Technological University*

Water lettuce (*Pistia stratiotes*) and water hyacinth (*Eichhornia crassipes*) are aquatic plants native to South America and are known for their ability to hyperaccumulate heavy metals from water without showing any symptoms of abiotic stress. Phytoremediation by aquatic plants can alleviate heavy metal contamination of water bodies arising from anthropogenic activities and natural processes. This is achieved through several mechanisms including phytoextraction. During phytoextraction, the production of peptides, such as metallothioneins, has been shown to improve the plant's tolerance to and accumulation of heavy metals.

Metallothioneins (MTs) are gene-encoded polypeptides that have highly conserved cysteine-rich motifs contributing close to 30% of the polypeptide chain. Studies have shown that MTs participate in various heavy metal tolerance processes in plants because of their capability of chelating and sequestering heavy metal ions such as zinc, copper, and cadmium using thiol groups present in cysteine residues. In our study, novel putative MT genes from *P. stratiotes* and *E. crassipes* were identified using bioinformatics and PCR, and gene expression analysis showed upregulation of proposed MT from *P. stratiotes* exposed to copper. To further improve our understanding of the function of novel putative MT genes from *P. stratiotes* and *E. crassipes*, the work presented here focused on optimizing recombinant MT protein expression in *E. coli* and investigating functions of MTs by means of increase in tolerance and accumulation of copper by transgenic *E. coli* harbouring putative novel MTs. Optimum conditions for recombinant soluble MT protein production in *E. coli* were observed, and an increase in tolerance and accumulation of copper by transgenic *E. coli* was confirmed. Characterizing of novel MT sequences is crucial for eco-engineers aiming to effectively utilize *P. stratiotes* and *E. crassipes* for alleviating heavy metal contamination in water.

A Low-cost Material for the Adsorption of Antibiotics

Wednesday, 27th March - 12:30: (Room F02, Dunmore Lecture Room, SETU, Waterford) - Oral

Mr. Erwin Onyekachukwu [1], ***Dr. Heather Nesbitt*** [1], ***Dr. Svetlana Tretsiakova-McNally*** [2], ***Dr. Heather Coleman*** [3]

1. *Ulster University,* ***2.*** *Belfast School of Architecture and the Built Environment, Ulster University, UK,* ***3.*** *School of Pharmacy and Pharmaceutical Science, Ulster University*

Pharmaceutical pollutants are emerging contaminants that pose significant risk to human health and environment. Their mode of action and persistence in the environment makes them a major concern. The presence of these compounds in the environment has led to the degradation of surface and sub-surface water quality, affecting the health of living organisms. The conventional water techniques for the elimination of pollutants have several drawbacks such as high operational costs, formation of by-products and poor reusability. Conversely, adsorption technique can be considered as a preferred choice due to its simple design, ease of operation, adaptability, efficiency and low costs. The aim of this study is to develop and apply an eco-friendly, readily available, and low-cost adsorbent for the removal of vancomycin. The choice of this antibiotic can be justified by its occurrence in wastewaters, with detection limits of 100.0 - 246.6 ng/l, and been listed on the WHO priority list of antibiotic resistance. For this study, the sawdust was blended and sieved into various particle sizes varying from 90 to 850 µm. The sawdust was treated with 2M sulfuric acid for 24 hours at room temperature and washed with distilled water several times until the neutral pH of washings. The selected sawdust fraction with 180 – 250 µm particles sizes was analyzed using a range of instrumentation techniques. The characteristics of the sawdust such as zeta potential, pH point zero charge, surface morphology, functional groups, specific surface area and pores volume were determined. The impact of operational parameters, including contact time, pH, temperature, and the initial concentration of the antibiotic on its adsorption on sawdust was evaluated using HPLC. The result of this study demonstrates how different adsorption parameters influence the adsorption of vancomycin on treated sawdust particles.

Sustainability of semiconductor fabrication

Wednesday, 27th March - 11:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Prof. Michael Morris [1]

1. *AMBER Director*

Prof. Morris leads the SFI funded research centre AMBER. His work has focused on self-assembly and phase separation in polymers and polymer solutions. Prof. Morris work also centres on the sustainability of materials. He leads a grant on looking at wood as a sustainable source of materials and particularly the use of forest waste. He also leads efforts in measuring the impact of circular solutions to new material technologies. He is a member of the ISO TC 323 technical committee developing standards for the circular economy. Prof. Morris has authored over 400 peer reviewed papers and more than 20 patents. Prof. Morris has worked closely with industry throughout his career. He leads the AMBER interaction with Merck in developing novel membrane materials and processes and works several other collaborating AMBER companies

Green chemistry synthesis of Cyclodextrin:fatty acids complexes: A sustainable approach alternative to antibiotics

Wednesday, 27th March - 12:00: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Dileep Reddy [1]***, Dr. Shiau Pin (Graece) Tan*** [2]***, Dr. Laurence Fitzhenry*** [3]

1. *SETU Waterford,* ***2.*** *Eco-innovation Research Centre (EIRC) / Pharmaceutical and Molecular Biotechnological Centre (PMBRC), South East Technological University (SETU) Waterford Campus, Ireland,* ***3.*** *Ocular Therapeutics Research Group (OTRG) / Pharmaceutical and Molecular Biotechnological Centre (PMBRC), South East Technological University (SETU) Waterford Campus, Ireland*

Introduction: This study aims to prepare cyclodextrin: fatty acid (FA) complexes using green chemistry principles. Specifically, the use of green chemistry procedure refers to the absence of conventional organic solvents during the complexation process, aligning with environmentally friendly and sustainable approach. FAs derived from natural sources such as plant oil and fish oil are sustainable alternatives to antibiotics. This study emphasises the importance of using green chemistry methodologies to synthesise cyclodextrin:FA complexes as a novel approach to addressing the growing concern of antibiotic resistance. These complexes may hold promise as potential drug delivery systems or therapeutic agents in various biomedical applications.

Method: The green chemistry approach utilised in this study involves the synthesis of cyclodextrin:FA complexes without conventionally used organic solvents. The processes focus on increasing the solubility of FAs in aqueous media through CD complexation. Different type of natural cyclodextrins (α-CD, β-CD & γ-CD) and its derivatives (HPγCD, HPβCD, RAMEB & SBEβCD) used in the synthesis of cyclodextrin:FA complexes. The study also evaluated the antimicrobial effect of FAs in various CD complexes against S. aureus.

Results: Cyclodextrin complexation significantly increased the FAs solubility in aqueous media. Depending on the type of cyclodextrin used in the complex the minimum inhibitory concentration (MIC) for various complexes were determined, which ranging from 20 µg/mL to 200 µg/mL.

Discussion: These results indicating that the solubility of FA enhanced when complexed with cyclodextrin. The intrinsic solubility of FA in water is 0.00045 mM, however in the presence of cyclodextrin the solubility increases significantly to 0.25 Mm, which represents an approximately 55-fold increase in solubility. The results also demonstrate the effectiveness of green chemistry in developing novel therapeutic agents. Furthermore, Cyclodextrin/FAs complexes could have significant implications for drug delivery and antimicrobial therapy.

Keywords: Green chemistry, Cyclodextrin complexes, Fatty acids, Antimicrobial activity

Designing a methane removal biological filter for on-site wastewater treatment systems

Wednesday, 27th March - 12:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Dr. Morgane Bellec [1], ***Dr. Masoud Ghaani*** [1], ***Dr. Muhammad Ali*** [1], ***Prof. Laurence Gill*** [1]

1. *Trinity College Dublin, the University of Dublin, Dublin 2, Ireland*

One-third of the Irish population uses on-site wastewater treatment systems. The anaerobic processes, mainly in the septic tanks, represent a significant source of methane. However, the methane is emitted at low concentrations, below 5%. It cannot be efficiently recovered or even flared as it is lower than its flammability level in the air. A promising alternative treatment is microbial oxidation by methanotrophs grown on a porous media. Such a passive biofilter can be placed over septic tank vents to convert the methane into carbon dioxide before it is released into the atmosphere.

While designing the biofilter, we must ensure that the methanotrophs oxidize all of the inflowing methane over the length of the filter, without overgrowing and obstructing the airflow. This requires complex investigations of both the fluid dynamics involved as well as microbial growth and other kinetic dynamics. Our approach combines experimental and numerical studies.

Using computational fluid dynamics (CFD) modelling, we obtain the gas flow velocities in the whole onsite wastewater treatment system. This allows us to select the best location to place the filter and estimate its inlet flow conditions. A prototype is then developed to gain knowledge on methanotroph activities by measuring the methane concentration at different heights of the filter, as it gets oxidised. The information obtained on the gas phase is used to develop multispecies biofilm models. Our models include heterotrophs, nitrifiers and sulphate-reducing bacteria; we show that the methanotrophs should not be outcompeted by the other microbial groups.

Keywords: methanotrophs, methane emissions reduction, biofilter

TRASH TO TREASURE: HARNESSING THE POWER OF AGRICULTURAL WASTES FOR GENERATING CLEANER WATER

Wednesday, 27th March - 12:30: (Room F03, Ardmore Lecture Room, SETU, Waterford) - Oral

Mr. Lekan Abudu [1], ***Ms. Rutuja Bhosale*** [2], ***Dr. Joerg Arnscheidt*** [3], ***Dr. Svetlana Tretsiakova-McNally*** [4], ***Dr. David Adeyemi*** [1], ***Prof. Luqman Adams*** [5], ***Dr. Temilola Oluseyi*** [5], ***Dr. Barry O'Hagan*** [6], ***Dr. Heather Coleman*** [2]

1. *Department of Pharmaceutical Chemistry, University of Lagos.,* ***2.*** *School of Pharmacy and Pharmaceutical Science, Ulster University,* ***3.*** *School of Geography and Environmental Science, Ulster University,* ***4.*** *Belfast School of Architecture and the Built Environment, Ulster University, UK,* ***5.*** *Department of Chemistry, University of Lagos,* ***6.*** *School of Biomedical Sciences, Ulster University*

The increase in global population has resulted in the escalating demand in food production, contributing to vast amounts of different agricultural waste. Their accumulation and unsustainable disposal practices can lead to serious environmental challenges. Agricultural run-offs contribute greatly to surface water pollution, therefore, meeting global food demand while protecting water quality and the environment are the key global challenges. One of the groups of pollutants of concern in the run-offs are the residual antibiotics and their presence or persistence in the environment is posing significant threats to human life. The available efforts have not achieved significant removal of residual antibiotics in wastewater, especially when ligno-cellulosic agricultural wastes have been deployed as alternative low-cost material. Therefore, the study herein focuses on the use of mahogany, an agricultural waste, *for* the removal of antibiotics (e.g., rifampicin) from water. The release of rifampicin to aqueous media urgently requires an effective alternative water treatment process, as the priority pathogens such as *mycobacterium tuberculosis* are becoming resistant to this class of antibiotic. The sawdust was dried and ground to produce particles with sizes ranging from 38 to 850 before undergoing a treatment with 2 M sulphuric acid. The concentration of rifampicin in aqueous solutions was measured using a UV-Vis spectrophotometer operating at wavelength of 333 nm. The adsorption experiments were conducted using a solution of rifampicin with 20 µg/mL concentration. The adsorption of antibiotic on untreated and treated mahogany sawdust had lowered the concentration of rifampicin in water by 16% and 39%, respectively, within 20 minutes of its contact with the particles the adsorbent. The removal rate of rifampicin by treated sawdust was doubled, which can be attributed to impact of sulphuric acid during the treatment process. This recent study demonstrated that the waste material was effective for the adsorption of rifampicin from water.

Longitudinal monitoring of Escherichia coli concentrations in surface waters and groundwater supplies within an Irish catchment during a series of extreme climate events.

Wednesday, 27th March - 11:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Robert Hynes [1]***, Dr. Zina Alfahl*** [1]***, Ms. Florence De Bock*** [1]***, Dr. Louise O'Connor*** [2]***, Dr. Paul D. Hynds*** [3]***, Dr. Jean O'Dwyer*** [4]***, Dr. Liam Burke*** [1]

1. *Antimicrobial Resistance and Microbial Ecology Group, School of Medicine, University of Galway, Galway, Ireland,* ***2.*** *Molecular Diagnostics Research Group, College of Science & Engineering, University of Galway, Ireland,* ***3.*** *Environmental Sustainability and Health Institute, Technological University Dublin, Ireland,* ***4.*** *School of Biological, Earth and Environmental Sciences, University College Cork, Cork, Ireland*

Private groundwater wells are widely used for drinking water in Ireland and are an important transmission route for waterborne pathogens. Source protection of these supplies requires understanding contamination dynamics at catchment level. Accordingly, the current study investigated longitudinal changes in *E. coli* concentrations in surface water bodies and groundwater wells located in the Corrib catchment in western Ireland over a six-month period.

From late May to early December 2023, 19 sites comprising river (n=5) and private groundwater wells (n=14) were sampled on a fortnightly basis in the Corrib catchment. The Colilert-18® method was employed to monitor the presence of total coliforms and *E. coli*. Sample data were merged with publicly available data, including groundwater vulnerability (GSI), rainfall (Met Éireann), and continuous river level and discharge data (OPW).

Overall, 265 samples were collected comprising 75 river samples and 190 groundwater samples. *E. coli* was detected in 178 samples (67%), including all 75 river samples (Mean MPN 452.7) and 103 (54%) of groundwater samples (Mean MPN 106.2, Median MPN 1).

River discharge was lowest in mid-June (mean = 0.349 m^3/s) following a 19-day period of absolute drought and record high temperatures. Rainfall peaked in mid-July (mean = 37.5mm), leading to increases in river discharge (peaking at 6.058 m^3/s in mid-July) and groundwater level (10.11m mean peaking at 9.77m two weeks after heavy rainfall), resulting in increased *E. coli* concentrations in rivers (mean MPN of 242.4 to mean MPN of 299.7) and groundwater wells (mean MPN of 27.7 a week before increased river concentrations to 604.7 MPN).

We describe the dynamics of *E. coli* in surface and groundwaters of a catchment in western Ireland during unprecedented record weather events. Findings will be useful in designing strategies for source protection and risk management of drinking water supplies.

Determination of aluminium in fish tissue to ensure the safety of phosphorus fixing chemicals: the case of two Irish lakes

Wednesday, 27th March - 12:00: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Juan Federico Bennett [1], ***Dr. Brian Rippey*** [1], ***Dr. Julie Campbell*** [1], ***Dr. Richard Douglas*** [1]

1. *Ulster University*

In the last decades, phosphorus (P) fixing chemicals have been applied in shallow lakes to counteract eutrophication. The retention of P in the sediments and the cessation of the internal loading process are the key to this technique's success. Despite the benefits of the application, the occurrence of potential harmful effects to biota must be monitored and may be related to dose applied, lake water pH and alkalinity, organic matter or the lake retention time, among others. In this study, an aluminium sulphate (alum) restoration has been implemented in the 2021-2022 winter, in two shallow eutrophic lakes located in Ireland. The dosing of the lake's surface was evenly performed by means of a boat that was equipped with a container which stored the alum and a chemical pump. Native fish species (perch, pike, roach and bream) were captured using gill-nets before and after treatment, and frozen in the laboratory. Before being analysed, the fish were thawed and liver, gills and muscle extractions were performed. The fragments were dried in an oven for one day and ground to form a fine powder. Tissue digestion was performed with the use of HNO_3, H_2O_2 and HCl at high temperatures. The digests were analysed by colour spectrophotometry to determine Aluminium (Al) concentrations in fish tissues. Muscle tissue experienced significantly less Al accumulation in both lakes compared to gills and liver. Furthermore, the three tissue types did not experience increased Al concentration in any of the lakes after the alum application; with liver, gills and muscle samples averaging 78, 66 and 13 ug/g dry tissue, respectively. The latter shows that the treatment was performed safely and without major biological impact.

Hydrological Simulation for the Owenabue Catchment – Application of the SWAT+ Model

Wednesday, 27th March - 12:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Mr. Rodhraí Crowley [1], ***Dr. Joe Harrington*** [1], ***Dr. Juan Tomás García*** [2], ***Dr. Juan Manuel García-Guerrero*** [2]

1. *Munster Technological University, Cork,* ***2.*** *Polytechnic University of Cartagena*

River catchment models have an important role to play in contributing to our understanding of critical source areas and providing quantitative estimates of runoff and runoff-associated pollutants such as sediment (Abdelwahab *et al.,* 2018), which has been receiving greater attention in a European context in recent years (Brils, 2020). This type of modelling can provide useful information for catchment management, which is a challenge in an Irish context as the most recent Environmental Protection Agency (2023) report indicates that overall, the biological quality of Irish surface waters did not improve in 2022 and remains subject to anthropogenic pressures. This paper presents a hydrological modelling study of the River Owenabue Catchment (117 km^2) in County Cork, Ireland. The Owenabue Catchment is dominated by agricultural land use (~ 95%), and the river discharges into the Owenabue Estuary which is a part of the Cork Harbour Special Protection Area under the EU Birds Directive (2009/147/EC). Here, the Soil and Water Assessment Tool (SWAT+) hydrological model (Bieger *et al.,* 2017) is applied for semi-distributed, continuous simulation of catchment hydrological processes at the catchment sub-basin scale. The model inputs, setup, modelling strategy (calibration and validation) and model results are presented and discussed. The paper shows that the SWAT+ model achieved satisfactory to very good model performance for simulation of daily and monthly mean river discharge (m^3/s) in the Owenabue Catchment. This also provides a basis for further modelling of hydrology and runoff-associated pollutants such as sediment in the catchment.

Keywords: hydrology, model, SWAT+, river discharge, sediment

Poly- and Perfluoroalkyl Substances (PFASs) from Source to Sink in the River Liffey

Wednesday, 27th March - 12:30: (Room F04, Lismore Lecture Room, SETU, Waterford) - Oral

Ms. Leila Bowe [1], ***Dr. Enrique Jacobo Diaz-Montaña*** [1], ***Prof. Fiona Regan*** [1], ***Dr. Belinda Huerta*** [2]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *Southern Connecticut State University*

Widespread use of poly- and perfluoroalkyl substances (PFAS) globally has raised concerns about potential legacy environmental contamination and subsequent impacts on human health. PFAS compounds are persistent and bioaccumulative, and their toxicity and long-range transportation of PFAS compounds has meant that they are ubiquitous in the environment and been detected globally in several sample types. Research in Ireland has indicated the presence of PFASs in a variety of media, including surface water.

The main objective of this work was to characterise risks by sampling surface water from 20 sites along the River Liffey, between a tributary to the sea. It was found that concentrations of up to 2 µg/L of individual PFAS compounds were detected along the river.

To interpolate the nature and distribution of PFAS compounds and identify potential links to upgradient sources, a 4-step hierarchical process was used.

1. Geographical proximity - The River Liffey flows through the centre of Dublin, Ireland and is known to have legacy contamination. Known primary and secondary sources of PFASs in the catchment of the river Liffey include civil (airports and fire stations), anthropogenic (wastewater treatment facilities and waste facilities) and industrial pressures (chemical manufacturing plants, paper processing facilities and industries with emissions licences).
2. Chemical footprint - Individual compounds have unique properties and different combinations are used by industries for specific purposes. By identifying unique compounds and distinguishable compound rations, a specific diffuse PFAS source can be inferred.
3. Dimensional calculation – A solute transport model was employed to predict the spatio-temporal fate of PFAS and infer proximity to industrial sources.
4. Dimensional modelling and cluster analysis was employed to refine the source identification.

With the data obtained, the occurrence of different PFAS substances was linked to potential civil, anthropogenic and industrial sources in the river Liffey catchment.

5 Minute Poster Presentations

ENABLE-BIO: bringing clarity to Bioeconomy regulations, to create a roadmap towards the creation of an enabling regulatory environment for the development of biobased innovations

Tuesday, 26th March - 12:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Robert Ludgate [1], Dr. Theresa Rubhara [2], Dr. Luke Kelleher [3], Dr. Eoin O'Neill [3], Dr. Helena Mc Mahon [2]

1. *Munster Technological University, Cork,* ***2.*** *Munster Technological University,* ***3.*** *University College Dublin*

The regulatory framework in agri-food waste management is currently complex, which is acting as a barrier to the development of biobased value chains and future waste stream utilisation. It is therefore important to ensure the policy, sectoral and regulatory coherence across all the sectors involved in bioeconomy development. The Enable-BIO project will provide a roadmap towards the creation of an enabling environment for innovations in the agrifood waste biobased value chains.

The project will first provide a database on the state of the art on the agri-food waste regulatory framework and the regulatory gaps which need to be filled for the advancement of the bioeconomy based on a systematic literature review. The project will also conduct a systematic literature review to provide an inventory of the regulatory framework and its impact on the agri-food waste streams, along with identifying and analysing good practices which can potentially be adopted in Ireland from International and EU examples by document analysis and evaluation of specific cases. This will provide an understanding of critical definitions, regulatory instruments (licences, permits, vision documents etc) and the impact of such on the management of agri-food waste streams.

Interviews and co-design workshops will also be used to explore in-depth regulatory barriers and recommendations to overcome such for business innovations involved in agri-food waste streams. These design thinking workshops will be carried out to promote engagement with stakeholders in the development of solutions to remove the regulatory bottlenecks identified earlier and co create guidelines which can be considered by policymakers.

The evidence from all the research activities will be used to build the road map to create an enabling environment. This will be crucial in helping inform Irish policymakers towards creating a policy framework which is tailormade to the Irish context to increase efficiency in waste management.

An evaluation of multispecies and grass-clover swards in a dairy grazing platform

Tuesday, 26th March - 12:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. orla mattimoe [1], ***Dr. John Finn*** [2], ***Dr. Michael Dineen*** [3], ***Dr. Karina Pierce*** [1], ***Mr. Aidan Lawless*** [2], ***Dr. Bridget Lynch*** [2]

1. *University College Dublin,* ***2.*** *Teagasc, Environment Research Centre, Johnstown Castle, Co. Wexford,* ***3.*** *Teagasc Food Research Centre Moorepark, Fermoy, Cork, Ireland*

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Reduced reliance on chemical nitrogen (N) fertiliser and minimising N loss to the environment are some of the greatest challenges facing pastoral dairy production systems today. Grassland dairy farmers have become increasingly interested in the use of multispecies swards to reduce both their chemical input and environmental impact. This study compared the milk production of two groups of Holstein Friesian cows grazing either a grass-clover sward (GC) containing *Lolium perenne (L. perenne)* and *Trifolium repens (T. repens)* (receiving an average of 178 kg/ha of chemical N per year) or a multispecies sward (MSS), containing *L.perenne, Phleum pratense, T.repens, Trifolium pratense, Cichorium intybus*, and *Plantago lanceolata* (receiving an average of 67 kg/ha of chemical N per year). The GC and MSS swards were established on separate farmlets in autumn 2019, and the experiment was carried out across the full grazing season (Feb to Nov) from 2020 to 2022 inclusive. Grazing was managed on a rotational basis, using target pre-grazing herbage dry matter (DM) (kg DM ha-1), post-grazing residual height (cm), and herbage allowance (kg DM cow-1). The weekly grazing wedge was determined by farm cover (herbage DM kg ha-1). The two treatments produced a similar milk yield of similar compositional quality across the first three years of the study, despite the MSS treatment receiving a reduced chemical nitrogen input. This experiment will continue in 2024 and 2025 and will include methane measurements using GreenFeed Technology. This study will further evaluate the effect of sward type on herbage and milk production in MSS under an intensive grazing system, in a long-term study.

Exploring the use of experiential marketing and extended reality technology to support the customer learning process of sustainability policies and principles.

Tuesday, 26th March - 15:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Rumbidzai Gandiwa [1], ***Dr. Rose Leahy*** [1], ***Dr. Pio Fenton*** [1]

1. *Munster Technological University, Cork*

Marketers have access to mass audiences, and through customer learning, they can play the role of educator and enlighten customers on why and how to live sustainably. This study aims to add to existing knowledge and provide insights into how marketers can harness the huge potential of XR technologies by creating experiences that will encourage customers to learn how to make sustainable lifestyle changes in areas such as waste management (SDG 12). Ireland has a waste problem and are failing to reach EU recycling and waste management targets which threatens the environment and people's health. The research is an experimental study comprised of two groups engaging in a waste sorting learning experience in either a VR simulated environment or a web application environment for comparison purposes. The study will adopt a mixed methodology research design where quantitative and qualitative data will be collected using surveys and knowledge tests that are used to track changes in knowledge throughout three phases of the data collection process. The research aims to contribute to literature on the following; effects of using XR technology to influence effective customer learning, outcome of utilising XR technology in experiential marketing to promoting sustainability, and, assessing how influential experiential marketing and XR technologies are in determining knowledge retention levels of sustainability messaging. Results of the research will contribute to global efforts to change attitudes and prompting people towards adopting more sustainable and environmentally friendly lifestyles through the use of impactful messaging and unique educational experiences. The research addresses several fundamental gaps in existing literature including the incorporation of fun in the context of experiential marketing and XR technology campaigns, the outcome of utilising XR technology in promoting sustainability through experiential marketing campaigns, and the influence of combining experiential marketing and XR technology in promoting customer learning of sustainability concepts.

REcycling of NUtrients to close the fertiliser CYCLE: the daughter project of ReNu2Farm works for soil nutrient sustainability in North West Europe

Tuesday, 26th March - 15:20: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Dr. Thomais Kakouli-Duarte [1], ***Dr. Kieran Germaine*** [2], ***Ms. Lilian Atira*** [2], ***Mr. Conor Geoghehan*** [2]

1. *South East Technological University, enviroCORE, Department of Applied Science,* ***2.*** *SETU Carlow*

The agricultural sector in NW Europe is highly dependent on world economic and geopolitical developments, as EU is importing annually more than 6 Mio t of nitrogen (N), phosphorus (P) and potassium (K) fertiliser. This is because Russia and Ukraine were the main N suppliers to EU, while P supply is heavily dependent on imports from Morocco. At the same time, organic waste streams, which can provide recycled NPK, remain mostly unexploited. In addition, due to a typically linear economic model, EU regions with nutrient surplus cannot provide recycling derived fertilisers (RDF) to EU nutrient deficient regions.

The overall objective of the Interreg-NWE part-funded ReNu2Cycle project is to reduce the dependency of NWE on fossil fuel associated fertiliser imports and establish RDF as a viable alternative in terms of availability, ecological impact and affordability to the farmers. This project is building upon the successes of the Interreg-NWE part funded ReNu2Farm project, which was the platform to establish baseline and regional data on fertiliser demand in the participating EU countries (IE, BE, NL, DE, FR, LU). ReNu2Cycle will explore regional best practices in NWE, utilising living lab concepts to encourage long-term co-innovation and implementation support by relevant stakeholders.

All findings will be capitalised in a transregional nutrient supply and demand strategy, which will determine subsequent regional action plans. These will subsequently aim to contribute further towards sustainable food security and circular economy in NWE.

The specific role of SETU in ReNu2Cycle will be to investigate the ecological impact of RDF in commercial farms in NW Europe, via analysing terrestrial nematode communities and aquatic invertebrates in the sites receiving these fertilisers and nearby rivers and streams.

Keywords: soil nutrient sustainability, recycling derived fertilisers, sustainable food security, circular economy, living labs, nematode communities, aquatic invertebrates, ecological impact assessments

FoodPath - Investigating behavioural interventions to reduce food waste in Irish households

Tuesday, 26th March - 15:25: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Keelin Tobin [1]***, Dr. Colum Gibson*** [1]***, Prof. Alberto Longo*** [2]

1. *Munster Technological University, Cork,* ***2.*** *Queen's University Belfast*

Food waste is a global issue, with an estimated one third being lost or wasted throughout the food supply chain, food waste has significant economic, social and environmental impacts. The EPA funded research project FoodPath developed and implemented food waste prevention interventions based on best practices in consumer behaviour change. First, the research team investigated current state of the art, which, together with interviews with national and international practitioners, informed the development of two intervention models. One of the interventions was designed to empower individuals to prevent and reduce food waste at the household level through tools, nudges and targeted messaging via their local waste collector. The second intervention took a broader approach and targeted the changing of social norms through community engagement via local stakeholders. In both cases, the delivery model was informed by stakeholder input and the evaluation methods included both quantitative (using waste collector data) and qualitative (employing householder surveys) assessments with controls. In the case of Intervention A, which targeted individuals and their management of food within their homes (through distribution of home food waste kits in collaboration with local waste collectors), the quantitative results were positive with a 16% reduction in food waste between the pre and post intervention periods. For intervention B, which involved a collaborative community approach aimed at changing social norms through information provision, training and animation, the quantitative results did not reveal a significant positive outcome. The outcomes of intervention A suggest that it may be a viable, and cost efficient, model. However, though the quantitative results for intervention B were limited, considering the extent of interest in community led initiatives, this approach should be viewed as an important precursor that, along with national awareness raising, could further amplify the impacts associated with the targeted approach developed in intervention A.

A compact light weight instrument for in situ detection of I2 and IO in the marine boundary layer

Tuesday, 26th March - 15:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. SHOGO SAITO [1], ***Dr. Caroline Womack*** [2], ***Dr. Steven Brown*** [2], ***Prof. Andy A. Ruth*** [3]

1. *University College Cork,* ***2.*** *NOAA Earth System Research Laboratory, R/CSD7, 325 Broadway, Boulder, CO 80305,* ***3.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork*

The release of molecular iodine (I_2) from the oceans into the atmosphere has been recognized to correlate strongly with ozone depletion events and aerosol formation in the Marine Boundary Layer (MBL), which in turn influences global radiative forcing [1]. The detailed mechanisms and dominant sources leading to the observed concentrations of I_2 and IO in the marine troposphere are still under intense investigation. One prime source of I_2 are air-exposed brown macro-algae (kelp) such as *laminaria digitata*, one of the most efficient iodine accumulators among living species [2]. How the distribution of molecular iodine in the MBL is related to the distribution of kelp in coastal areas during low and high tides has not been fully established yet. In order to 2D or 3D map the distribution of I_2 on representative shoreline we are developing a highly sensitive, compact and lightweight instrument for the detection of I_2, IO and OIO. The instrument is based on so-called incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS) [3], which combines a good temporal and spatial resolution with high molecule-specific detection limits.

In this presentation we outline the spectroscopic measurement principles of the instrument. Its current design, engineering features, and some of its specifications will be summarized and experiments to characterize the instrument will be presented. Some applications and future experiments/campaigns will also be portrayed.

Grant acknowledgement: SFI Frontier Award 21/FFP-A-8973 (AtmoTrace)

[1] A. Saiz-Lopez, J.M.C. Plane, Novel iodine chemistry in the marine boundary layer. Geophys. Res. Lett. 31, L04112 (2004).

[2] G. McFiggans, et al., Direct evidence for coastal iodine particles from Laminaria macroalgae - linkage to emissions of molecular iodine. Atmos. Chem. Phys. 4, 701–713 (2004).

[3] S.E. Fiedler et al. Incoherent broad-band cavity-enhanced absorption spectroscopy. Chem. Phys. Lett. 371, 284–294 (2003).

Determining the potential for co-benefits for biodiversity conservation and renewable energy generation in solar farms in Ireland

Tuesday, 26th March - 15:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Sean Morris [1]***, Mr. James O'Riordan*** [1]***, Ms. Anita Ortega*** [1]***, Dr. Sarah McCormack*** [1]***, Dr. Jane Stout*** [1]

1. *Trinity College Dublin*

Energy demands are ever increasing while governments around the world place their reliance in renewable energy sources to limit the environmental problems that arise from fossil fuels. Ireland is no different and has set targets to increase uptake in renewable sources. As part of Ireland's Climate action plan 2023, a target of 8 GWs of solar PV is to be connected to the grid by 2030 [1]. As of June 2023, the ISEA reported that Ireland's current installed PV capacity stands at 680MW [2] [3]. From 2018-2020 the average size of solar farms in Ireland was between 20-40 hectares, while between 2021-2023 projects of over 100 hectares have entered the planning stages [4]. It is clear the target of 8 GW will require extensive land use all over Ireland, and it is important not to trade any benefits gained in renewable energy generation with the cost of destroying or disrupting local biodiversity. This project aims to understand the impact of solar farm installations on local microclimates and to develop strategies to mitigate biodiversity loss at solar farm sites due to these microclimates. Microclimate indicators such as relative humidity, wind speed, solar irradiance, soil moisture and air temperature will be measured at various positions throughout each solar farm, such as under solar modules, between module rows and at field boundaries. Data gathered from these sensors will be compared to an adjacent field under the same management regime as the solar farm was prior to the installation of the PV array, this will act as the control in order to evaluate the impact on local microclimates induced by the installation of PV arrays. Through this research, the aim is to gain a better understanding of the potential impacts with the widespread deployment of PV arrays as Ireland progresses towards its 8GW target.

Investigating the effects of glyphosate-based herbicides and their alternatives on the soil microbiome

Tuesday, 26th March - 15:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Sophia Couchman [1], ***Dr. Mathavan Vickneswaran*** [2], ***Dr. Grace Hoysted*** [1], ***Mr. Stephen Seaman*** [1], ***Mr. Dónall Flanagan*** [3], ***Dr. James Carolan*** [1]

1. *Maynooth University,* ***2.*** *School of Chemical Sciences, Dublin City University,* ***3.*** *Teagasc, Horticulture Development Department, Dublin*

The use of herbicides, such as glyphosate and commercial products that contain it, has become controversial over recent years. Although widely used in agriculture for weed control, reseeding and ripening of certain crops, its use on public and amenity lands has come under scrutiny. Central to this is the growing body of evidence that in certain contexts herbicides like glyphosate may pose detrimental effects to public health, biodiversity and the environment. This requires a better understanding of these effects and an assessment of alternatives to glyphosate. Leading this call in Ireland are County Councils that are seeking alternative ways to remove plants effectively from areas within public open spaces.

The aim of this research is to assess alternatives to glyphosate for plant control and impacts on the soil microbiome in an open grassland site. In total five weed controls (2 glyphosate and 3 non-glyphosate based) were applied to replicated and randomized $1m^2$ plots with typical grassland cover. Vegetation was assessed prior to treatment and twice post treatment. In addition, soil core samples were taken at the same timepoints to assess changes in fungal and bacterial communities. Soil samples were used for DNA extraction and the Fungal Internal Transcribed Spacer and bacterial 16S rRNA gene were sequenced. MicroResp analysis was used to measure carbon source preference by the soil microbiome which provided a general overview of microbial community composition and changes in response to a specific treatment.

Our preliminary findings indicate that differences in fungal (and to a lesser extent bacterial) profiles across the different timepoints are associated with the different treatments and that some alternatives are very effective at plant control. These findings will be very useful for county councils in the management of open public spaces.

Keywords: plant management; glyphosate; alternatives to glyphosate; herbicide; microbiome; bacteria; fungi; councils; environment

Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland

Tuesday, 26th March - 15:20: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Michaela Bartley [1]

1. *Department of Life Sciences, Atlantic Technological University Sligo*

Michaela M. Bartley[1], Hayley Buttimer[1], Seán F. Jordan[2], Brian Kelleher[2], and Shane S. O'Reilly [1]

1. Department of Life Sciences, Atlantic Technological University Sligo

2. School of Chemical Sciences, Dublin City University

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Healthy soils are essential in achieving climate neutrality, reversing biodiversity loss, providing nutritious food, and safeguarding human health. Despite decades of soil research, we still do not have adequate measures of soil health that provide an overall advanced assessment of health for specific soils and land use types. This is attributed to the complexity of soil as a material and ecosystem, the diversity of soil types and land uses and to a large extent, the global focus on soil as a resource mainly for agriculture rather than soil as an essential part of environmental protection, such as air and water quality. The EPA funded project Microbial and Metabolite-based indicators for Soil Health (MMeSH) aims to address the need for biological soil health indicators and environmental protection of soils by using a combined lipidomics, metabolomics, and genomics approach. Advanced mass spectrometry- and nuclear magnetic resonance-based techniques will be used to identify an array of lipids and metabolites that correspond to a unique set of microorganisms in soils from key land use types. Additionally, taxonomic and functional gene metagenomics will provide the most detailed characterisation of soil microbial biodiversity and metabolic activity of soils in Ireland. A collaborative Geological Survey Ireland (GSI) funded project will use a suite of biological and chemical tests in addition to pre-existing land use, soil type, and geochemical GSI/Tellus datasets and maps to validate the new 'omics'-based indicators of soil health. To-date, 89 of the total 200 sites have been sampled in collaboration with University College Dublin's TellSoilBio team.

Keywords: soil health indicators, lipids, metabolomics, metagenomics, soil biodiversity

A new cavity ring-down instrument for airborne monitoring of N2O5, NO3, NO2 and O3 in the upper troposphere lower stratosphere

Tuesday, 26th March - 17:00: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Paul Wills [1], ***Dr. William Dubé*** [1], ***Dr. Andreas Zahn*** [2], ***Dr. Steven Brown*** [3], ***Prof. Andy A. Ruth*** [4]

1. *School of Physics, University College Cork,* ***2.*** *Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, D-76344 Eggenstein-Leopoldshafen,* ***3.*** *NOAA Earth System Research Laboratory, R/CSD7, 325 Broadway, Boulder, CO 80305,* ***4.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork*

The chemistry of NO_3 and N_2O_5 is important to the regulation of tropospheric and stratospheric ozone. *In situ* detection of NO_3 and N_2O_5 in the upper troposphere lower stratosphere (UTLS) represents a new scientific direction as the only previous measurements of these species in this region of the atmosphere has been via remote sensing. Because both the sources and the sinks of NO_3 and N_2O_5 are potentially stratified in the atmosphere, their mixing ratios, and their influence on nitrogen oxide and ozone transport at night can show large variability as a function of altitude. Aircraft-based measurements of heterogeneous N_2O_5 uptake in the lower troposphere have uncovered a surprising degree of variability in the uptake coefficient, but there are no corresponding high altitude measurements.

Before the COVID pandemic an airfreight container with 19 different automated instruments from European research partners was utilized on board a commercial Lufthansa airbus to monitor ~100 atmospheric species (trace gases and aerosol parameters) in the UTLS. During the pandemic the activities came to a halt and as of 2022 the research activities were moved to a new aircraft. The development of the new container is ongoing and its launch is planned for 2024/25. The updated instrumentation will include a new cavity ring-down device for monitoring nitrogen oxides, jointly developed by researchers from Cork (Ireland), Boulder (USA) and Karlsruhe (Germany). The compact and light-weight instrument is designed to monitor NO_3 , N_2O_5, NO_2 and O_3. The detection is based on 4 high-finesse optical cavities. The air sampled underneath the cargo bay of the aircraft is distributed over all four cavities via a dedicated inlet system. All procedures are fully automated and controlled by dedicated electronics and software within the device. On the poster the new instrument, its design and application within the CARIBIC program, will be outlined.

Stability Assessment and Characterization of Whelk Shell Calcined Calcium Oxide (CaO) for Practical Applications

Tuesday, 26th March - 17:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Ms. Fatima Zahra [1], ***Dr. Mike Kinsella*** [2], ***Prof. Helen Hughes*** [3], ***Dr. Shiau Pin (Graece) Tan*** [3]

1. *Eco-innovation Research Centre (EIRC) / Pharmaceutical and Molecular Biotechnological Centre (PMBRC), South East Technological University (SETU) Waterford Campus, Ireland,* ***2.*** *SETU Waterford,* ***3.*** *South East Technological University*

The study investigates the stability and antibacterial properties of calcium oxide (CaO) derived from whelk shells through calcination at various temperatures (750°C, 850°C, and 1000°C). The stability of CaO samples was evaluated under standard conditions (including exposure to water, room temperature storage, and desiccator storage). Results show that the CaO samples exposure to water, room temperature storage, and desiccator storage, sample remained stable for two weeks, while samples calcined at 850°C and 1000°C and stored in a desiccator exhibited extended stability up to four weeks. Structural and elemental analysis conducted through Fourier-transform infrared spectroscopy (FTIR), energy-dispersive X-ray spectroscopy (EDX), and scanning electron microscopy (SEM) revealed the composition of the whelk shell-derived CaO. The antibacterial efficacy of the calcined samples was assessed using the well diffusion technique, indicating significant inhibitory effects against both *E. coli* and *S. aureus* (average zones of inhibition: 15mm, 16mm and 17mm, respectively). Further investigations will explore the potential applications of these CaO derivatives in combating foodborne pathogens and in pharmaceutical products, paint industry, and food industry.

Keywords: Whelk shell, Calcium oxide, Antibacterial applications, Stability assessment,
FTIR, EDX, SEM, *E. coli, S. aureus.*

High Resolution Basemaps and Orthographic Site Images – Fast, Easy & Robust

Wednesday, 27th March - 10:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Dr. Richard Terres [1]

1. *Hook Air Surveying*

Advances in small camera drones and technical software mean that high-resolution orthographic image basemaps/sitemaps are now possible to plan, fly, and process quickly and reliably.

These drone-based orthographic images are mosaics of up to several thousand separate photographs that are rigorously indexed, 3D mapped and ortho-rectified. The process is quick and inexpensive and can provide extremely useful basemaps and references for a variety of Environmental, Archaeological and Geotechnical purposes. Orthographic image resolutions of up to 1 cm/pixel and covering areas of up to more than a km2, can now be easily produced.

With the advent of this quick and on-demand orthographic imagery, the possibility of widespread 4D applications also opens. There now is an ability to capture bespoke high resolution before and after images for qualitative and some quantitative evaluations of feature change, including flooding, erosion, pollution, tidal impacts, fires, and industrial activities.

This poster will illustrate drone orthographic imagery for several environmental/geotechnical characterization projects. Each image was planned, flown, processed, and produced in well under 3 hours total elapsed time (some in less than 1 hour). The products shown include orthographic images, digital elevation maps and 3D models for various projects in environmentally sensitive settings: estuary, river, coast, forest, peatland and mountain.

Improving intertidal seaweed classification using UAV RGB and multispectral sensing

Wednesday, 27th March - 10:50: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Damir Akhmetshin [1], ***Dr. Leon Cavanagh*** [1], ***Dr. Dean Callaghan*** [1], ***Dr. Owen Naughton*** [1]

1. *South East Technological University*

The use of unmanned aerial vehicles (UAVs) equipped with lightweight, off-the-shelf RGB and multispectral sensors for environmental monitoring has expanded dramatically in recent years. Macroalgae provide vital ecological services and economic resources along coastlines but face pressures requiring effective monitoring. Precise species mapping is critical for addressing conservation challenges. This study investigates the use of UAVs equipped with RGB and multispectral sensors for enhanced classification and assessment of intertidal seaweed habitats. UAV surveys were conducted at three Irish coastal sites to collect RGB and multispectral datasets. Three classification algorithms – Random Forest, Maximum Likelihood Classifier, and Support Vector Machines – were tested on RGB, multispectral, and combined RGB-multispectral data to compare species classification accuracies and percent cover estimates. RGB data effectively classified broad intertidal classes but struggled differentiating some seaweed species. Multispectral data significantly improved species-level classification accuracy but tended to overestimate the presence of red and green algae. Fusing the RGB and multispectral data improved classification accuracy over the individual datasets by leveraging the strengths of each sensor type, achieving overall accuracies over 80%. This highlights the potential of UAVs coupled with off-the-shelf visible range and multispectral cameras to provide detailed, accurate, and affordable change monitoring of intertidal seaweed habitats.

A Practical Toolkit Supporting Educators to Incorporate Sustainability in Third Level Curriculums

Wednesday, 27th March - 10:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Dr. Emer Emily Neenan [1], ***Dr. Nataliya Romanyatova*** [1], ***Ms. Ailish O'Brien*** [2]

1. *SETU Waterford,* ***2.*** *SETU Carlow*

Sustainability is a complex and multi-faceted topic, developing at an accelerating pace, covering a range of key local-to-global issues. It incorporates social, economic, and environmental perspectives (as described in the National Strategy on Education for Sustainable Development). Educators in Higher Education must develop the skills and confidence to tackle these complex and overlapping issues as they incorporate these discussions into curriculums. The South East Technological University (SETU) aims to integrate sustainability across the whole university and within curriculums through the SETU Strategic Plan.

This poster outlines the development of a Sustainability Toolkit, which aims to enable staff to integrate sustainability thinking into the design of existing or future curriculums. The toolkit aims to provide a practical and accessible suite of examples, case studies, resources, and pedagogical supports to educators. The toolkit is a living resource, designed and expanded in a co-creative process within the SETU community. It links explicitly to the United Nations Sustainable Development Goals, connecting to the global conversation while rooted in the south-east region of Ireland. Although designed with the SETU community as the primary audience, the toolkit is openly available, and is flexible and adaptable for use in other institutions, regions, and education sectors.

This presentation describes the development and format of the toolkit, in an accessible and interactive format.

Assessment of Ulva intestinalis (Chlorophyta) optimal growth factors under laboratory conditions

Wednesday, 27th March - 12:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Vanessa Nardini [1], ***Prof. Dagmar B. Stengel*** [1]

1. *University of Galway*

As part of the wider MSCA SeaChem Doctoral Network which aims to assess new techniques for off-shore seaweed cultivation to produce high-value substances for a range of industries, this project defines seaweed optimum growth conditions (location, methodologies, infrastructure requirements) considering predicted global change scenarios.

Specifically, performance of *Ulva intestinalis* (Chlorophyta) under different temperature and salinity regimes is evaluated to identify optimum growth conditions while obtaining most the desirable chemical composition.

The *Ulva* genus is globally distributed, typically occurring in the upper tidal levels that are exposed to strong, and rapid, environmental fluctuations. *U. intestinalis* commonly inhabits high-shore rockpools where seawater is retained during low tide. This green seaweed has the high potential to become more relevant in the aquaculture sector for both aquafeed and human consumption, and in bioremediation.

The investigating methods consider both eco-physiological and biochemical aspects: seaweed response is assessed via measurements of primary productivity (O_2 evolution and chlorophyll fluorescence) and content of high-value chemicals using HPLC and Gas Chromatography.

This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon Europe under SEACHEM Grant Agreement No. 101073471.

Keywords: *Ulva*, environmental stressors, primary productivity, biomass, chemical composition

Net Ecosystem CO2 Exchange From a Peatland Under Restoration

Wednesday, 27th March - 12:35: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Md Shamsuzzaman [1], ***Dr. Shane Regan*** [2], ***Mr. Mark O'Connor*** [2], ***Dr. Ultan Mc Carthy*** [1], ***Dr. Imelda Casey*** [1], ***Dr. Owen Naughton*** [1]

1. *South East Technological University,* ***2.*** *National Park and Wildlife Service, Dublin, Ireland*

Peatlands are the earth's largest natural terrestrial carbon store and represent over 50% of all the soil carbon stock in the Republic of Ireland. However, peatlands are a significant source of carbon emissions in Ireland due to a long history of unsustainable management through drainage, commercial and domestic peat extraction, and conversion to forestry and agriculture. Current projections show that Ireland will struggle to meet its climate change commitment of a 30% reduction in GHG emissions as set out in the national Climate Action Plan and Paris Agreement. For this commitment to be met, restoration of drained peatlands is now considered to be an essential and effective natural solution. In 2019, the National Park and Wildlife Services (NPWS) embarked on a project to restore a designated Special Area of Conservation at the All Saints raised bog located in County Offaly. An Eddy Covariance tower was installed to monitor the net ecosystem CO2 exchange accurately. This ongoing study is designed to track variations in carbon emissions from the site, capturing data both before and after the restoration efforts over a period of two years. Early indications suggest that the restoration has yielded promising outcomes, including the presence of a significant water reserve, which is critical for the bog's ecosystem. However, initial results also indicate substantial carbon emissions are still occurring. To delve deeper into these findings, the study will integrate chamber measurements across various gradients. The aim is to elucidate both the temporal and seasonal emission patterns, as well as identify the key biotic and abiotic factors driving these emissions. This comprehensive approach will provide valuable insights into the effectiveness of the restoration processes and contribute to a broader understanding of carbon dynamics in peatland ecosystems.

Cultivation of high-protein plant biomass using an agri-food wastewater for a circular economy

Wednesday, 27th March - 12:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Jingrou Chen [1]***, Prof. Marcel Jansen*** [1]***, Dr. Neil Coughlan*** [1]

1. *School of Biological, Earth and Environmental Sciences, University College Cork, Cork, Ireland & Environmental Research Institute, University College Cork, Cork, Ireland*

As agri-food sectors use large amounts of treated freshwater annually, it is important to maximize water reuse. The joint biological treatment and valorisation could facilitate the cleaning of wastewaters and their reuse within the circular economy. While the implementation of high-tech biological treatment into existing processing facilities might best suit larger industries, the possibility of localised treatment hubs to support smaller agri-food enterprises could be beneficial. The water fern, *Azolla filiculoides* (Azolla), is a small, floating, nitrogen-fixing aquatic plant that can exhibit rapid growth even when grown on nutrient-rich wastewaters. Moreover, Azolla has a high crude-protein content (25-30%) and is increasingly being used as an alternative protein source for livestock across Asia and South America. Incorporation of Azolla into a wastewater management scheme within bio-secure indoor cultivation systems could support the valorisation of agri-food wastewaters and promote a closed plant-nutrient cycle, whereby nitrogen and phosphorus will be recovered in the Azolla biomass and recycled in the agricultural food chain. Within the laboratory, preliminary investigations were performed for cultivation of Azolla on wastewater sourced from a large commercial meat processor (i.e., abattoir). Plant biomass generation was assessed for Azolla grown on various concentrations of the meat processing wastewater (Control, 5%, 25%, 50%, 100%) and different pH levels (5, 6 and 7.2 pH) under laboratory conditions for seven-days. The relative growth rate (RGR) of Azolla tended to be similarly high across all concentrations, while pH of 5 and 6 displayed similar growth compared to Azolla grown on the unadjusted pH (pH 7.2). These results indicate that meat processing wastewater can be a suitable cultivation medium for Azolla. The results of this study underpin the development of Azolla phytoremediation and high-protein biomass production as part of agri-food wastewater management for a circular economy.

A compact light weight instrument for in situ detection of I2 and IO in the marine boundary layer

Tuesday, 26th March - 15:15: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

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Mr. SHOGO SAITO [1], ***Dr. Caroline Womack*** [2], ***Dr. Steven Brown*** [2], ***Prof. Andy A. Ruth*** [3]

1. *University College Cork,* ***2.*** *NOAA Earth System Research Laboratory, R/CSD7, 325 Broadway, Boulder, CO 80305,* ***3.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork*

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1. *School of Physics, University College Cork,* ***2.*** *Karlsruhe Institute of Technology, Institute for Meteorology and Climate Research, D-76344 Eggenstein-Leopoldshafen,* ***3.*** *NOAA Earth System Research Laboratory, R/CSD7, 325 Broadway, Boulder, CO 80305,* ***4.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork*

The chemistry of NO_3 and N_2O_5 is important to the regulation of tropospheric and stratospheric ozone. *In situ* detection of NO_3 and N_2O_5 in the upper troposphere lower stratosphere (UTLS) represents a new scientific direction as the only previous measurements of these species in this region of the atmosphere has been via remote sensing. Because both the sources and the sinks of NO_3 and N_2O_5 are potentially stratified in the atmosphere, their mixing ratios, and their influence on nitrogen oxide and ozone transport at night can show large variability as a function of altitude. Aircraft-based measurements of heterogeneous N_2O_5 uptake in the lower troposphere have uncovered a surprising degree of variability in the uptake coefficient, but there are no corresponding high altitude measurements.

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Improving intertidal seaweed classification using UAV RGB and multispectral sensing

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Mr. Damir Akhmetshin [1], ***Dr. Leon Cavanagh*** [1], ***Dr. Dean Callaghan*** [1], ***Dr. Owen Naughton*** [1]

1. *South East Technological University*

The use of unmanned aerial vehicles (UAVs) equipped with lightweight, off-the-shelf RGB and multispectral sensors for environmental monitoring has expanded dramatically in recent years. Macroalgae provide vital ecological services and economic resources along coastlines but face pressures requiring effective monitoring. Precise species mapping is critical for addressing conservation challenges. This study investigates the use of UAVs equipped with RGB and multispectral sensors for enhanced classification and assessment of intertidal seaweed habitats. UAV surveys were conducted at three Irish coastal sites to collect RGB and multispectral datasets. Three classification algorithms – Random Forest, Maximum Likelihood Classifier, and Support Vector Machines – were tested on RGB, multispectral, and combined RGB-multispectral data to compare species classification accuracies and percent cover estimates. RGB data effectively classified broad intertidal classes but struggled differentiating some seaweed species. Multispectral data significantly improved species-level classification accuracy but tended to overestimate the presence of red and green algae. Fusing the RGB and multispectral data improved classification accuracy over the individual datasets by leveraging the strengths of each sensor type, achieving overall accuracies over 80%. This highlights the potential of UAVs coupled with off-the-shelf visible range and multispectral cameras to provide detailed, accurate, and affordable change monitoring of intertidal seaweed habitats.

ENABLE-BIO: bringing clarity to Bioeconomy regulations, to create a roadmap towards the creation of an enabling regulatory environment for the development of biobased innovations

Tuesday, 26th March - 12:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Robert Ludgate [1], Dr. Theresa Rubhara [2], Dr. Luke Kelleher [3], Dr. Eoin O'Neill [3], Dr. Helena Mc Mahon [2]

1. *Munster Technological University, Cork,* ***2.*** *Munster Technological University,* ***3.*** *University College Dublin*

The regulatory framework in agri-food waste management is currently complex, which is acting as a barrier to the development of biobased value chains and future waste stream utilisation. It is therefore important to ensure the policy, sectoral and regulatory coherence across all the sectors involved in bioeconomy development. The Enable-BIO project will provide a roadmap towards the creation of an enabling environment for innovations in the agrifood waste biobased value chains.

The project will first provide a database on the state of the art on the agri-food waste regulatory framework and the regulatory gaps which need to be filled for the advancement of the bioeconomy based on a systematic literature review. The project will also conduct a systematic literature review to provide an inventory of the regulatory framework and its impact on the agri-food waste streams, along with identifying and analysing good practices which can potentially be adopted in Ireland from International and EU examples by document analysis and evaluation of specific cases. This will provide an understanding of critical definitions, regulatory instruments (licences, permits, vision documents etc) and the impact of such on the management of agri-food waste streams.

Interviews and co-design workshops will also be used to explore in-depth regulatory barriers and recommendations to overcome such for business innovations involved in agri-food waste streams. These design thinking workshops will be carried out to promote engagement with stakeholders in the development of solutions to remove the regulatory bottlenecks identified earlier and co create guidelines which can be considered by policymakers.

The evidence from all the research activities will be used to build the road map to create an enabling environment. This will be crucial in helping inform Irish policymakers towards creating a policy framework which is tailormade to the Irish context to increase efficiency in waste management.

Assessment of Ulva intestinalis (Chlorophyta) optimal growth factors under laboratory conditions

Wednesday, 27th March - 12:30: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Vanessa Nardini [1], ***Prof. Dagmar B. Stengel*** [1]

1. *University of Galway*

As part of the wider MSCA SeaChem Doctoral Network which aims to assess new techniques for off-shore seaweed cultivation to produce high-value substances for a range of industries, this project defines seaweed optimum growth conditions (location, methodologies, infrastructure requirements) considering predicted global change scenarios.

Specifically, performance of *Ulva intestinalis* (Chlorophyta) under different temperature and salinity regimes is evaluated to identify optimum growth conditions while obtaining most the desirable chemical composition.

The *Ulva* genus is globally distributed, typically occurring in the upper tidal levels that are exposed to strong, and rapid, environmental fluctuations. *U. intestinalis* commonly inhabits high-shore rockpools where seawater is retained during low tide. This green seaweed has the high potential to become more relevant in the aquaculture sector for both aquafeed and human consumption, and in bioremediation.

The investigating methods consider both eco-physiological and biochemical aspects: seaweed response is assessed via measurements of primary productivity (O_2 evolution and chlorophyll fluorescence) and content of high-value chemicals using HPLC and Gas Chromatography.

This project has received funding from the European Union's EU Framework Programme for Research and Innovation Horizon Europe under SEACHEM Grant Agreement No. 101073471.

Keywords: *Ulva*, environmental stressors, primary productivity, biomass, chemical composition

Net Ecosystem CO2 Exchange From a Peatland Under Restoration

Wednesday, 27th March - 12:35: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Md Shamsuzzaman [1], ***Dr. Shane Regan*** [2], ***Mr. Mark O'Connor*** [2], ***Dr. Ultan Mc Carthy*** [1], ***Dr. Imelda Casey*** [1], ***Dr. Owen Naughton*** [1]

1. *South East Technological University,* ***2.*** *National Park and Wildlife Service, Dublin, Ireland*

Peatlands are the earth's largest natural terrestrial carbon store and represent over 50% of all the soil carbon stock in the Republic of Ireland. However, peatlands are a significant source of carbon emissions in Ireland due to a long history of unsustainable management through drainage, commercial and domestic peat extraction, and conversion to forestry and agriculture. Current projections show that Ireland will struggle to meet its climate change commitment of a 30% reduction in GHG emissions as set out in the national Climate Action Plan and Paris Agreement. For this commitment to be met, restoration of drained peatlands is now considered to be an essential and effective natural solution. In 2019, the National Park and Wildlife Services (NPWS) embarked on a project to restore a designated Special Area of Conservation at the All Saints raised bog located in County Offaly. An Eddy Covariance tower was installed to monitor the net ecosystem CO2 exchange accurately. This ongoing study is designed to track variations in carbon emissions from the site, capturing data both before and after the restoration efforts over a period of two years. Early indications suggest that the restoration has yielded promising outcomes, including the presence of a significant water reserve, which is critical for the bog's ecosystem. However, initial results also indicate substantial carbon emissions are still occurring. To delve deeper into these findings, the study will integrate chamber measurements across various gradients. The aim is to elucidate both the temporal and seasonal emission patterns, as well as identify the key biotic and abiotic factors driving these emissions. This comprehensive approach will provide valuable insights into the effectiveness of the restoration processes and contribute to a broader understanding of carbon dynamics in peatland ecosystems.

Investigating the effects of glyphosate-based herbicides and their alternatives on the soil microbiome

Tuesday, 26th March - 15:15: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Sophia Couchman [1], ***Dr. Mathavan Vickneswaran*** [2], ***Dr. Grace Hoysted*** [1], ***Mr. Stephen Seaman*** [1], ***Mr. Dónall Flanagan*** [3], ***Dr. James Carolan*** [1]

1. *Maynooth University,* ***2.*** *School of Chemical Sciences, Dublin City University,* ***3.*** *Teagasc, Horticulture Development Department, Dublin*

The use of herbicides, such as glyphosate and commercial products that contain it, has become controversial over recent years. Although widely used in agriculture for weed control, reseeding and ripening of certain crops, its use on public and amenity lands has come under scrutiny. Central to this is the growing body of evidence that in certain contexts herbicides like glyphosate may pose detrimental effects to public health, biodiversity and the environment. This requires a better understanding of these effects and an assessment of alternatives to glyphosate. Leading this call in Ireland are County Councils that are seeking alternative ways to remove plants effectively from areas within public open spaces.

The aim of this research is to assess alternatives to glyphosate for plant control and impacts on the soil microbiome in an open grassland site. In total five weed controls (2 glyphosate and 3 non-glyphosate based) were applied to replicated and randomized $1m^2$ plots with typical grassland cover. Vegetation was assessed prior to treatment and twice post treatment. In addition, soil core samples were taken at the same timepoints to assess changes in fungal and bacterial communities. Soil samples were used for DNA extraction and the Fungal Internal Transcribed Spacer and bacterial 16S rRNA gene were sequenced. MicroResp analysis was used to measure carbon source preference by the soil microbiome which provided a general overview of microbial community composition and changes in response to a specific treatment.

Our preliminary findings indicate that differences in fungal (and to a lesser extent bacterial) profiles across the different timepoints are associated with the different treatments and that some alternatives are very effective at plant control. These findings will be very useful for county councils in the management of open public spaces.

Keywords: plant management; glyphosate; alternatives to glyphosate; herbicide; microbiome; bacteria; fungi; councils; environment

Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland

Tuesday, 26th March - 15:20: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Michaela Bartley [1]

1. *Department of Life Sciences, Atlantic Technological University Sligo*

Michaela M. Bartley[1], Hayley Buttimer[1], Seán F. Jordan[2], Brian Kelleher[2], and Shane S. O'Reilly [1]

1. Department of Life Sciences, Atlantic Technological University Sligo

2. School of Chemical Sciences, Dublin City University

Corresponding Author Email Address: S00247437@atu.ie

Healthy soils are essential in achieving climate neutrality, reversing biodiversity loss, providing nutritious food, and safeguarding human health. Despite decades of soil research, we still do not have adequate measures of soil health that provide an overall advanced assessment of health for specific soils and land use types. This is attributed to the complexity of soil as a material and ecosystem, the diversity of soil types and land uses and to a large extent, the global focus on soil as a resource mainly for agriculture rather than soil as an essential part of environmental protection, such as air and water quality. The EPA funded project Microbial and Metabolite-based indicators for Soil Health (MMeSH) aims to address the need for biological soil health indicators and environmental protection of soils by using a combined lipidomics, metabolomics, and genomics approach. Advanced mass spectrometry- and nuclear magnetic resonance-based techniques will be used to identify an array of lipids and metabolites that correspond to a unique set of microorganisms in soils from key land use types. Additionally, taxonomic and functional gene metagenomics will provide the most detailed characterisation of soil microbial biodiversity and metabolic activity of soils in Ireland. A collaborative Geological Survey Ireland (GSI) funded project will use a suite of biological and chemical tests in addition to pre-existing land use, soil type, and geochemical GSI/Tellus datasets and maps to validate the new 'omics'-based indicators of soil health. To-date, 89 of the total 200 sites have been sampled in collaboration with University College Dublin's TellSoilBio team.

Keywords: soil health indicators, lipids, metabolomics, metagenomics, soil biodiversity

An evaluation of multispecies and grass-clover swards in a dairy grazing platform

Tuesday, 26th March - 12:45: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. orla mattimoe [1], ***Dr. John Finn*** [2], ***Dr. Michael Dineen*** [3], ***Dr. Karina Pierce*** [1], ***Mr. Aidan Lawless*** [2], ***Dr. Bridget Lynch*** [2]

1. *University College Dublin,* ***2.*** *Teagasc, Environment Research Centre, Johnstown Castle, Co. Wexford,* ***3.*** *Teagasc Food Research Centre Moorepark, Fermoy, Cork, Ireland*

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Reduced reliance on chemical nitrogen (N) fertiliser and minimising N loss to the environment are some of the greatest challenges facing pastoral dairy production systems today. Grassland dairy farmers have become increasingly interested in the use of multispecies swards to reduce both their chemical input and environmental impact. This study compared the milk production of two groups of Holstein Friesian cows grazing either a grass-clover sward (GC) containing *Lolium perenne (L. perenne)* and *Trifolium repens (T. repens)* (receiving an average of 178 kg/ha of chemical N per year) or a multispecies sward (MSS), containing *L.perenne, Phleum pratense, T.repens, Trifolium pratense, Cichorium intybus*, and *Plantago lanceolata* (receiving an average of 67 kg/ha of chemical N per year). The GC and MSS swards were established on separate farmlets in autumn 2019, and the experiment was carried out across the full grazing season (Feb to Nov) from 2020 to 2022 inclusive. Grazing was managed on a rotational basis, using target pre-grazing herbage dry matter (DM) (kg DM ha-1), post-grazing residual height (cm), and herbage allowance (kg DM cow-1). The weekly grazing wedge was determined by farm cover (herbage DM kg ha-1). The two treatments produced a similar milk yield of similar compositional quality across the first three years of the study, despite the MSS treatment receiving a reduced chemical nitrogen input. This experiment will continue in 2024 and 2025 and will include methane measurements using GreenFeed Technology. This study will further evaluate the effect of sward type on herbage and milk production in MSS under an intensive grazing system, in a long-term study.

Developing novel biological 'omics'-based indicators of soil health across key land use types in Ireland

Tuesday, 26th March - 15:20: (Room F04, Lismore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

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Ms. Michaela Bartley [1]

1. *Department of Life Sciences, Atlantic Technological University Sligo*

Michaela M. Bartley[1], Hayley Buttimer[1], Seán F. Jordan[2], Brian Kelleher[2], and Shane S. O'Reilly [1]

1. Department of Life Sciences, Atlantic Technological University Sligo

2. School of Chemical Sciences, Dublin City University

Corresponding Author Email Address: S00247437@atu.ie

Healthy soils are essential in achieving climate neutrality, reversing biodiversity loss, providing nutritious food, and safeguarding human health. Despite decades of soil research, we still do not have adequate measures of soil health that provide an overall advanced assessment of health for specific soils and land use types. This is attributed to the complexity of soil as a material and ecosystem, the diversity of soil types and land uses and to a large extent, the global focus on soil as a resource mainly for agriculture rather than soil as an essential part of environmental protection, such as air and water quality. The EPA funded project Microbial and Metabolite-based indicators for Soil Health (MMeSH) aims to address the need for biological soil health indicators and environmental protection of soils by using a combined lipidomics, metabolomics, and genomics approach. Advanced mass spectrometry- and nuclear magnetic resonance-based techniques will be used to identify an array of lipids and metabolites that correspond to a unique set of microorganisms in soils from key land use types. Additionally, taxonomic and functional gene metagenomics will provide the most detailed characterisation of soil microbial biodiversity and metabolic activity of soils in Ireland. A collaborative Geological Survey Ireland (GSI) funded project will use a suite of biological and chemical tests in addition to pre-existing land use, soil type, and geochemical GSI/Tellus datasets and maps to validate the new 'omics'-based indicators of soil health. To-date, 89 of the total 200 sites have been sampled in collaboration with University College Dublin's TellSoilBio team.

Keywords: soil health indicators, lipids, metabolomics, metagenomics, soil biodiversity

Determining the potential for co-benefits for biodiversity conservation and renewable energy generation in solar farms in Ireland

Tuesday, 26th March - 15:15: (Room F03, Ardmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Mr. Sean Morris [1], ***Mr. James O'Riordan*** [1], ***Ms. Anita Ortega*** [1], ***Dr. Sarah McCormack*** [1], ***Dr. Jane Stout*** [1]

1. *Trinity College Dublin*

Energy demands are ever increasing while governments around the world place their reliance in renewable energy sources to limit the environmental problems that arise from fossil fuels. Ireland is no different and has set targets to increase uptake in renewable sources. As part of Ireland's Climate action plan 2023, a target of 8 GWs of solar PV is to be connected to the grid by 2030 [1]. As of June 2023, the ISEA reported that Ireland's current installed PV capacity stands at 680MW [2] [3]. From 2018-2020 the average size of solar farms in Ireland was between 20-40 hectares, while between 2021-2023 projects of over 100 hectares have entered the planning stages [4]. It is clear the target of 8 GW will require extensive land use all over Ireland, and it is important not to trade any benefits gained in renewable energy generation with the cost of destroying or disrupting local biodiversity. This project aims to understand the impact of solar farm installations on local microclimates and to develop strategies to mitigate biodiversity loss at solar farm sites due to these microclimates. Microclimate indicators such as relative humidity, wind speed, solar irradiance, soil moisture and air temperature will be measured at various positions throughout each solar farm, such as under solar modules, between module rows and at field boundaries. Data gathered from these sensors will be compared to an adjacent field under the same management regime as the solar farm was prior to the installation of the PV array, this will act as the control in order to evaluate the impact on local microclimates induced by the installation of PV arrays. Through this research, the aim is to gain a better understanding of the potential impacts with the widespread deployment of PV arrays as Ireland progresses towards its 8GW target.

Exploring the use of experiential marketing and extended reality technology to support the customer learning process of sustainability policies and principles.

Tuesday, 26th March - 15:15: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Rumbidzai Gandiwa [1], ***Dr. Rose Leahy*** [1], ***Dr. Pio Fenton*** [1]

1. *Munster Technological University, Cork*

Marketers have access to mass audiences, and through customer learning, they can play the role of educator and enlighten customers on why and how to live sustainably. This study aims to add to existing knowledge and provide insights into how marketers can harness the huge potential of XR technologies by creating experiences that will encourage customers to learn how to make sustainable lifestyle changes in areas such as waste management (SDG 12). Ireland has a waste problem and are failing to reach EU recycling and waste management targets which threatens the environment and people's health. The research is an experimental study comprised of two groups engaging in a waste sorting learning experience in either a VR simulated environment or a web application environment for comparison purposes. The study will adopt a mixed methodology research design where quantitative and qualitative data will be collected using surveys and knowledge tests that are used to track changes in knowledge throughout three phases of the data collection process. The research aims to contribute to literature on the following; effects of using XR technology to influence effective customer learning, outcome of utilising XR technology in experiential marketing to promoting sustainability, and, assessing how influential experiential marketing and XR technologies are in determining knowledge retention levels of sustainability messaging. Results of the research will contribute to global efforts to change attitudes and prompting people towards adopting more sustainable and environmentally friendly lifestyles through the use of impactful messaging and unique educational experiences. The research addresses several fundamental gaps in existing literature including the incorporation of fun in the context of experiential marketing and XR technology campaigns, the outcome of utilising XR technology in promoting sustainability through experiential marketing campaigns, and the influence of combining experiential marketing and XR technology in promoting customer learning of sustainability concepts.

REcycling of NUtrients to close the fertiliser CYCLE: the daughter project of ReNu2Farm works for soil nutrient sustainability in North West Europe

Tuesday, 26th March - 15:20: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Dr. Thomais Kakouli-Duarte [1], ***Dr. Kieran Germaine*** [2], ***Ms. Lilian Atira*** [2], ***Mr. Conor Geoghehan*** [2]

1. *South East Technological University, enviroCORE, Department of Applied Science,* ***2.*** *SETU Carlow*

The agricultural sector in NW Europe is highly dependent on world economic and geopolitical developments, as EU is importing annually more than 6 Mio t of nitrogen (N), phosphorus (P) and potassium (K) fertiliser. This is because Russia and Ukraine were the main N suppliers to EU, while P supply is heavily dependent on imports from Morocco. At the same time, organic waste streams, which can provide recycled NPK, remain mostly unexploited. In addition, due to a typically linear economic model, EU regions with nutrient surplus cannot provide recycling derived fertilisers (RDF) to EU nutrient deficient regions.

The overall objective of the Interreg-NWE part-funded ReNu2Cycle project is to reduce the dependency of NWE on fossil fuel associated fertiliser imports and establish RDF as a viable alternative in terms of availability, ecological impact and affordability to the farmers. This project is building upon the successes of the Interreg-NWE part funded ReNu2Farm project, which was the platform to establish baseline and regional data on fertiliser demand in the participating EU countries (IE, BE, NL, DE, FR, LU). ReNu2Cycle will explore regional best practices in NWE, utilising living lab concepts to encourage long-term co-innovation and implementation support by relevant stakeholders.

All findings will be capitalised in a transregional nutrient supply and demand strategy, which will determine subsequent regional action plans. These will subsequently aim to contribute further towards sustainable food security and circular economy in NWE.

The specific role of SETU in ReNu2Cycle will be to investigate the ecological impact of RDF in commercial farms in NW Europe, via analysing terrestrial nematode communities and aquatic invertebrates in the sites receiving these fertilisers and nearby rivers and streams.

Keywords: soil nutrient sustainability, recycling derived fertilisers, sustainable food security, circular economy, living labs, nematode communities, aquatic invertebrates, ecological impact assessments

FoodPath - Investigating behavioural interventions to reduce food waste in Irish households

Tuesday, 26th March - 15:25: (Room FO1, Tramore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Keelin Tobin [1], ***Dr. Colum Gibson*** [1], ***Prof. Alberto Longo*** [2]

1. *Munster Technological University, Cork,* ***2.*** *Queen's University Belfast*

Food waste is a global issue, with an estimated one third being lost or wasted throughout the food supply chain, food waste has significant economic, social and environmental impacts. The EPA funded research project FoodPath developed and implemented food waste prevention interventions based on best practices in consumer behaviour change. First, the research team investigated current state of the art, which, together with interviews with national and international practitioners, informed the development of two intervention models. One of the interventions was designed to empower individuals to prevent and reduce food waste at the household level through tools, nudges and targeted messaging via their local waste collector. The second intervention took a broader approach and targeted the changing of social norms through community engagement via local stakeholders. In both cases, the delivery model was informed by stakeholder input and the evaluation methods included both quantitative (using waste collector data) and qualitative (employing householder surveys) assessments with controls. In the case of Intervention A, which targeted individuals and their management of food within their homes (through distribution of home food waste kits in collaboration with local waste collectors), the quantitative results were positive with a 16% reduction in food waste between the pre and post intervention periods. For intervention B, which involved a collaborative community approach aimed at changing social norms through information provision, training and animation, the quantitative results did not reveal a significant positive outcome. The outcomes of intervention A suggest that it may be a viable, and cost efficient, model. However, though the quantitative results for intervention B were limited, considering the extent of interest in community led initiatives, this approach should be viewed as an important precursor that, along with national awareness raising, could further amplify the impacts associated with the targeted approach developed in intervention A.

Cultivation of high-protein plant biomass using an agri-food wastewater for a circular economy

Wednesday, 27th March - 12:45: (Room F02, Dunmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Ms. Jingrou Chen [1]***, Prof. Marcel Jansen*** [1]***, Dr. Neil Coughlan*** [1]

1. *School of Biological, Earth and Environmental Sciences, University College Cork, Cork, Ireland & Environmental Research Institute, University College Cork, Cork, Ireland*

As agri-food sectors use large amounts of treated freshwater annually, it is important to maximize water reuse. The joint biological treatment and valorisation could facilitate the cleaning of wastewaters and their reuse within the circular economy. While the implementation of high-tech biological treatment into existing processing facilities might best suit larger industries, the possibility of localised treatment hubs to support smaller agri-food enterprises could be beneficial. The water fern, *Azolla filiculoides* (Azolla), is a small, floating, nitrogen-fixing aquatic plant that can exhibit rapid growth even when grown on nutrient-rich wastewaters. Moreover, Azolla has a high crude-protein content (25-30%) and is increasingly being used as an alternative protein source for livestock across Asia and South America. Incorporation of Azolla into a wastewater management scheme within bio-secure indoor cultivation systems could support the valorisation of agri-food wastewaters and promote a closed plant-nutrient cycle, whereby nitrogen and phosphorus will be recovered in the Azolla biomass and recycled in the agricultural food chain. Within the laboratory, preliminary investigations were performed for cultivation of Azolla on wastewater sourced from a large commercial meat processor (i.e., abattoir). Plant biomass generation was assessed for Azolla grown on various concentrations of the meat processing wastewater (Control, 5%, 25%, 50%, 100%) and different pH levels (5, 6 and 7.2 pH) under laboratory conditions for seven-days. The relative growth rate (RGR) of Azolla tended to be similarly high across all concentrations, while pH of 5 and 6 displayed similar growth compared to Azolla grown on the unadjusted pH (pH 7.2). These results indicate that meat processing wastewater can be a suitable cultivation medium for Azolla. The results of this study underpin the development of Azolla phytoremediation and high-protein biomass production as part of agri-food wastewater management for a circular economy.

A Practical Toolkit Supporting Educators to Incorporate Sustainability in Third Level Curriculums

Wednesday, 27th March - 10:45: (Room F03, Ardmore Lecture Room, SETU, Waterford) - 5 min poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - 5 min poster

Dr. Emer Emily Neenan [1], ***Dr. Nataliya Romanyatova*** [1], ***Ms. Ailish O'Brien*** [2]

1. *SETU Waterford,* ***2.*** *SETU Carlow*

Sustainability is a complex and multi-faceted topic, developing at an accelerating pace, covering a range of key local-to-global issues. It incorporates social, economic, and environmental perspectives (as described in the National Strategy on Education for Sustainable Development). Educators in Higher Education must develop the skills and confidence to tackle these complex and overlapping issues as they incorporate these discussions into curriculums. The South East Technological University (SETU) aims to integrate sustainability across the whole university and within curriculums through the SETU Strategic Plan.

This poster outlines the development of a Sustainability Toolkit, which aims to enable staff to integrate sustainability thinking into the design of existing or future curriculums. The toolkit aims to provide a practical and accessible suite of examples, case studies, resources, and pedagogical supports to educators. The toolkit is a living resource, designed and expanded in a co-creative process within the SETU community. It links explicitly to the United Nations Sustainable Development Goals, connecting to the global conversation while rooted in the south-east region of Ireland. Although designed with the SETU community as the primary audience, the toolkit is openly available, and is flexible and adaptable for use in other institutions, regions, and education sectors.

This presentation describes the development and format of the toolkit, in an accessible and interactive format.

Posters

Examining the Drivers that Shape Sustainable Consumer Behavioral Intentions of Regional Leisure and Visiting Friends and Relatives (VFR) Passengers in the Irish Aviation Industry.

Tuesday, 26th March - 12:35: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Amy Whelan [1]

1. *SETU Waterford*

The research will explore the underlying factors that drive sustainable leisure and VFR travel in order to contribute to the achievement of the United Nations Sustainable Development Goals (SDGs).The SDG's were adopted by all United Nations Member States in 2015 as a call to end poverty, to protect the planet and to ensure that all people enjoy peace and prosperity by the year 2030.

Individuals are becoming increasingly concerned about environmental, social, and economic issues, and are willing to act on those concerns. This heightened awareness of their environmental footprint has prompted individuals to re-evaluate their purchasing behaviours, often showing a greater willingness to invest in products and services that possess eco-friendly attributes. Consequently, businesses have been compelled to reassess their sustainability efforts in response to this shifting consumer landscape. While passengers may possess a moral obligation to lead sustainable lifestyles, their ability to do so effectively relies on the support provided by governments, non-governmental organisations (NGOs), and the businesses they engage with. Thus, while individuals and passengers alike may recognise the significance of sustainable consumption, the translation of this awareness into actual sustainable consumer behaviour is not always straightforward.

Therefore, this research seeks to understand passengers attitudes and behavioural intention towards sustainable aviation and travel and examine the attitude-behaviour gap in sustainable tourism and aviation in Ireland. Specifically, this mixed-methodology research will:

1. Explore the topic of sustainable travel and impact this has on Leisure and Visiting Friends and Relatives (VFR) travel segments.
2. Explore the drivers of sustainable travel within the context of leisure and VFR travel.
3. Propose a model that will act as a framework for understanding sustainable travel behavioural intention throughout the travel related consumer decision making processes.
4. Provide a deeper understanding of sustainable travel drivers and implications for travel and tourism related marketers.

A Bibliometric Analysis of the Research Publications on Climate Change for the Last 7 Years

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Asfand Bakht Yar [1], ***Dr. Ken Boyle*** [1]

1. *Technological University Dublin*

Research has always played a critical role in the development of the narrative for global acceptance of the issue of climate change and the necessary mitigation and adaptation measures that are required to address climate change in the coming decades. The IPCC Assessment Reports are based on a synthesis of thousands of research publications. Education forms a foundation for nation building and the most important part of that foundation is research. In essence, Climate change-related research is now crucial to monitoring progress and creating solutions for the world. This research also informs education at all levels and climate research in higher education institutions feeds into the education process.

This study examines the number of climate change-related publications from Irish Higher Education Institutions from 2017 to early 2024 on the Scopus database. The years were selected to analyse pre-COVID and post-COVID impact on the publications related to the field. Research is found to be predominantly based in the science disciplines with a limited number of publications coming from the Arts and Humanities. Climate change is a cross-disciplinary issue which requires a response based on research across disciplines. In addition to teaching and awareness campaigns, climate research is fundamental to the development of policies and strategies to adapt and mitigate climate change. The challenge or crisis requires an all-society response. To support such a broad response, a broader research base, including Arts and humanities is needed. The current study examines the “Climate Change” Keyword used in research publications in Ireland and across several other countries and identifies disciplines that have a low percentage of publications on Climate Change as compared to other disciplines.

Climate change vulnerability of cultural landscapes and intangible heritage: a research gap between nature, culture, and community

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Samantha Tobias [1]

1. *University College Dublin*

Climate Vulnerability Assessments (CVAs) are commonly used to quantify the degree to which a system is susceptible to adverse climate change effects. Based on theoretical research of state-of-the-art CVAs, but with the aim to integrate community voices and landscape-level perspectives, I want to design my own CVA framework that will enable the identification of the impacts and challenges climate change poses to biocultural intangible heritage traditions at living cultural landscapes.

Bringing together the current state of knowledge regarding climate vulnerability of intangible heritage, biocultural traditions, and landscapes, and global examples of long-term adaptation strategies, the framework I will design is a holistic, landscape-level heritage management tool.

The poster will demonstrate what I have done so far and how I will, going forward, apply the framework to two climatically similar case studies in rural, marginalised areas with traditional, biocultural heritage threatened by and exposed to rapid climate change. This case study methodology will consist of semi-structured interviews and observational landscape-level research that emphasizes key features in a vulnerable landscape of particular value to the community or identified by international, national, or local heritage policies.

Following an iterative, community-integrated review process, I aim to produce a spatial GIS representation of climate vulnerability overlaid with the cultural geographies of intangible heritage and the landscape. The goal of my research is to contribute to a holistic interpretation of the sites' abilities to adjust to climate change.

Development of a Cumulative Effects Assessment Framework for Ireland's Marine Planning Process

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Virginia Morejón [1]

1. *University College Dublin*

The rapid expansion of human activities in coastal and marine environments, driven by our increasing demands and needs, presents significant challenges to global and national priorities in preserving the integrity of marine ecosystems. Pressures like overexploitation of both biotic and abiotic resources , bycatch, habitat disturbance, underwater noise, and pollution are amongst the major stressors resulting from the activities of multiple maritime sectors. In Ireland, the European Union's Marine Spatial Planning Directive has been implemented through the National Marine Planning Framework (NMPF), serving as a guide to manage the sustainable growth of marine sectors and address subsequent pressures on the marine environment. Nevertheless, the NMPF lacks guidance on a systematic approach for cumulative effects assessment (CEA), highlighting the need for a tailored method that addresses the unique needs of local marine spatial planning in Irish waters. This presentation aims to underscore the importance of advancing our understanding of primary human-environment interactions within Irish waters, focusing on inherent pressures from activities, their interactions, and their combined impact on marine ecosystems. Drawing on the perspectives of consulted experts, the presentation seeks to illuminate cumulative pressures and their varied impacts across different areas in Irish waters, encompassing the Irish Sea, the Celtic Sea, and the Atlantic Ocean. The insights gained will lay groundwork for a GIS-based CEA approach aligned with the criteria specified in the NMPF, the Marine Strategy Framework Directive, as well as the Strategic Environmental Assessment Directive, recognising the significance of marine planning decision-making at this comprehensive scale.

Detection of PMT Chemicals in Environmental Samples via SPE and HPLC Analysis

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Alexander Savelev [1], ***Ms. Rebecca Smith*** [1], ***Dr. David O'Connor*** [1], ***Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University*

Background

Persistent, Mobile, and Toxic (PMT) chemicals are a group of chemicals that mainly come from the agricultural and pharmaceutical industries. They are capable of passing through wastewater treatment plants unimpeded. They can resist degradation, and pose threats to both human health and the environment.

Such chemicals demand urgent attention, as once they are released, these chemicals remain and circulate in waterways, leading to a concentration build up over time. These chemicals are toxic even at low concentrations, an issue amplified by the fact by increasing emissions of these chemical components. A proportion of these PMT chemicals are challenging to analyse via conventional laboratory techniques and require specialized equipment. As a result they are in an analytical gap. Consequently, many PMT chemicals remain unmonitored. Recognizing the impact these chemicals can cause, it is crucial to prioritize proactive measures over reactive removal. The removal of these chemicals from the environment poses greater challenges than their current monitoring and restriction. This emphasizes the need to safeguard ecosystems and human well-being from the persistent threat of PMT chemicals.

Methods

This work involves concentrating pre-collected Irish environmental samples using Solid Phase Extraction (SPE) and analysing using High-Performance Liquid Chromatography (HPLC) focusing on prioritized PMT chemicals.

Results/conclusions

Using SPE the chemicals will be preconcentrated into a smaller volume so that they can be detected by Liquid Chromatography (LC). The HPLC chromatograph will give insight into the levels of certain PMT chemicals in environmental samples. Using a dilution factor the concentration can be adjusted to the amount present in the environment.

By employing these methodologies, a more thorough understanding of PMT chemicals in the environment, supporting informed strategies for monitoring and mitigating their impact.

Evaluation of air quality patterns in Dublin pre to post COVID-19 restriction

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mrs. Grace Udoka [1], ***Prof. Patrick Goodman*** [1], ***Dr. Eoin McGillicuddy*** [1], ***Dr. Nwachi Louis*** [1]

1. *Technological University Dublin*

The global outbreak of COVID-19 caused unprecedented societal changes, leading to a comprehensive investigation into its multifaceted impacts. Gaining insights into the variations in air quality across different times and locations during the COVID-19 restriction period can serve as a valuable reference point, facilitating the development and implementation of new policies aimed at improving air quality. This comparative study explores the impact of COVID-19 restriction measures on air quality in Dublin, evaluating monthly air pollutant concentrations during the lockdown period against the previous years. The analysis examines trends in air pollutant variations pre-lockdown to post-lockdown. The results reveal a consistent seasonal pattern across monitoring stations, with a notable reduction during and after the COVID-19 lockdown. The study provides comprehensive insights into the environmental implications of COVID-19-related restrictions on air pollutant concentrations, contributing essential information for urban air quality management strategies.

Analysing the Impact of Diesel Train Movements on PM2.5 Levels in Dublin Heuston Station Using Random Forest Models

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. YUXUAN GUO [1], ***Mr. Shanmuga Priyan*** [1], ***Dr. John Gallagher*** [1], ***Prof. Aonghus Mc Nabola*** [1], ***Prof. Margaret O'Mahony*** [1], ***Prof. Brian Broderick*** [1], ***Prof. Brian Caulfield*** [1]

1. *Trinity College Dublin*

This study provides an in-depth analysis of the factors affecting particulate matter (PM2.5) concentrations in Dublin Heuston Station, focusing on the influence of diesel train movements. Utilising hourly data collected from low-cost sensors at the platform and concourse, we applied Random Forest models to explore the relationship between PM2.5 levels and various contributing factors, including ambient conditions and train traffic. The models demonstrate a moderate to good fit, indicated by Root Mean Squared Error (RMSE) values of 3.54 for the platform and 2.95 for the concourse and R-squared values of 0.65 and 0.72, respectively. The models revealed that the background concentration is the most influential factor in predicting PM2.5 levels at both the platform and concourse. However, the number of arrivals and departures of different train models also demonstrated significant impacts, with specific models like the 3 ICR and 8 MKIV exerting a greater influence on PM2.5 concentration. Through Interaction effect analysis and Partial Dependence Plots, we delineated the nuanced contributions of various train types to PM2.5 concentrations, particularly emphasising the greater impact of arrivals compared to departures. The study provides vital insights for station management and policymakers in designing targeted strategies for air quality improvement. By understanding the interactions between train traffic and environmental variables, effective measures can be implemented to mitigate the impact of train movements on PM2.5 levels.

Radioactivity in salmon *(Salmo salar)* and oysters *(Crassostrea gigas)* farmed in the Irish Sea and North Atlantic waters.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Angus Collison [1]***, Dr. Claire Keary*** [2]***, Dr. Liam Morrison*** [3]***, Ms. Olwyn Hanley*** [4]***, Dr. Joe Murphy*** [1]***, Prof. Luis León Vintró*** [5]

1. *School of Science and Computing, South East Technological University,* ***2.*** *Lecturer in Physics, School of Science and Computing, South East Technological University,* ***3.*** *Earth and Life Sciences, School of Natural Sciences, University of Galway,* ***4.*** *Office of Radiation Protection and Environmental Monitoring, Environmental Protection Agency,* ***5.*** *School of Physics, University College Dublin*

Radionuclide monitoring within the Irish marine environment has focused on assessing the impact, and potential public health implications of discharges of artificial radionuclide waste from the Sellafield nuclear fuel reprocessing site in Cumbria (UKinto the Irish Sea. These discharges commenced in the early 1950s, and peaked between the late 1970s and early 1980s, and have since reduced significantly. This has resulted in significant research on the geographical and temporal spread of these artificial radionuclides discharged from Sellafield. In comparison, little data exists on the presence of natural radionuclides within the Irish marine environment. Samples of Pacific Oysters (*Crassostrea gigas*)were acquired from seven commercial oyster farms along the Irish coastline, while samples of Irish, Norwegian and Scottish farmed Atlantic Salmon (*Salmo salar* were acquired from Irish retailers and fishmongers. Concentrations of the natural radionuclides ^{40}K, ^{210}Pb, ^{226}Ra, ^{228}Ra and ^{238}U, as well as the artificial ^{137}Cs were determined using high-resolution gamma spectrometry. The naturally occurring ^{210}Po was chemically separated from the sample and determined using high-resolution alpha-spectrometry. The artificial radionuclide ^{137}Cs was detected at much lower activity concentrations than the other natural radionuclides in both the oysters and salmon, while ^{40}K and ^{210}Po had the highest activity concentrations in the oysters and ^{40}K had the highest activity concentration in salmon. The radionuclide activity concentrations were used to determine the potential dose associated from the consumption of salmon and oysters. For a typical oyster consumer (0.54 kg/year)‡the annual effective dose was estimated to be 44 µSv, while for a typical salmon consumer (4.7 kg/year)‡the estimated annual effective dose was 12 µSv, with most of the dose in both cases due to ^{210}Po. The estimated doses, however, are well below the annual dose limit for a member of the public (1000 µSv).

Optimisation of SPE and LC-MS Methods for the Determination of Antibiotic Concentration in Liquid Samples.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Kalina Dobrowolska [1], ***Dr. Xinmin Zhan*** [2], ***Dr. Shohei Yasuda*** [2], ***Dr. Dylan O'Flynn*** [1], ***Dr. Chloe Richards*** [1], ***Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *University of Galway*

In 2015, an estimated 11,134.97 tonnes of antibiotics were consumed in 59 countries, projected to increase to 128 billion doses by 2030. Antibiotics that are not fully metabolised by the organism end up in wastewater treatment plants. Conventional wastewater treatment plants cannot completely remove antibiotics, which remain in anaerobic treated effluents(ATEs). ATEs lead to the occurrence of antibiotic resistance genes due to their interaction with microbes in treatment facilities. This establishes a clear link between antibiotic use and antibiotic resistance, which causes over 700,000 deaths per year. It is necessary to measure antibiotic levels in the environment, but the precision of existing methods is limited by matrix effects. Matrix effects are an increase or decrease in the response of the target analyte, and can dramatically alter the performance of an analytical method.

The aim of this work was to quantify the concentration of antibiotics in water using Solid Phase Liquid Extraction(SPE) and Liquid Chromatography-Mass Spectrometry(LC-MS). SPE was performed using Oasis HLB 200 µg cartridges, and the retained analyte was eluted with acetonitrile and reconstituted in a 10:10:80 methanol:acetonitrile:water solution. LC-MS/MS analysis was completed using an Agilent HPLC instrument. The column used was a Zorbax eclipse plus C18 2.1 x 50 mm 1.8 µm LC column at 30℃. A 6470A triple-quadrupole mass-spectrometer with electrospray-ionisation (Agilent Technologies) was used for detection. Data was collected using MassHunter software. The antibiotic sulfamethoxazole(SMX) was detected in each of the investigated surface water bodies. The highest detected concentration was 3.2 ng/L showing a matrix effect of 321% (6.33% matrix effect SD).

At present, there is no method developed for the detection of antibiotics that is not subjected to inaccuracies due to matrix effects. The developed method allows for the precise and accurate detection of antibiotics in water samples, by decreasing the occurrence of matrix effects.

Experiences and recommendations from the implementation of low-cost soil moisture and water table sensors

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Dr. Ciprian Briciu-Burghina [1]***, Dr. Muhammad Intizar Ali*** [2]***, Prof. Fiona Regan*** [1]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *School of Electronic Engineering, Dublin City University*

Soil moisture is an essential parameter for irrigation management, transport of pollutants and estimation of energy, heat and water balances. Soil moisture is one of the most important soil spatial-temporal variables due the highly heterogeneous nature of soils which in turn drive water fluxes, evapotranspiration, air temperature, precipitation and soil erosion. Water table measured are essential, particularly at peatland sited undergoing rehabilitation where a complete understanding of the water cycle is needed.

In this context, a demonstration of *in-situ* LoRaWAN sensor networks is presented. The network has been operating for 12 months at a peatland site (Cavemount Bog, Offaly, Ireland) which is currently undergoing a rehabilitation process through re-wetting. The site uses a suite of sensors for soil moisture and water table measurements (ultrasonic and pressure transducers) for continuous measurement at 8 locations. Th analytical performance of the sensors has been determined in the laboratory, through calibrations in liquids of known dielectric permittivity and through field validation via sample collection or time domain-reflectometry instrumentation (TDR). Experiences and recommendations in deploying, maintaining and servicing the sensor networks, data management (cleaning, validation, analysis) will be presented and discussed. Emphasis will be placed on the key learnings to date and the performance of the low cost sensor networks in terms of collected data.

Small scale sensor networks like these are expected to bridge the gap between the low spatial resolution provided by the satellite-derived products and the single point/field measurements. Within the project, the sensor network will provide spatial observations to complement existing fixed point measurements. It will allow researchers to investigate SM dynamics at field scale in response to different soil types, soil density, elevation, and land cover.

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Photonic Integration of Quartz Enhanced Photoacoustic Spectroscopy Sensors for Greenhouse Gas Detection in Agriculture

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Cian Twomey [1], ***Mr. Gabriele Biagi*** [1], ***Prof. Andy A. Ruth*** [2], ***Dr. Marilena Giglio*** [3], ***Prof. Vincenzo Spagnolo*** [3], ***Dr. Liam O'Faolain*** [1], ***Dr. Anton Walsh*** [1]

1. *Munster Technological University, Cork,* ***2.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork,* ***3.*** *PolySense Lab, Dipartimento Interateneo di Fisica, University and Politecnico of Bari, Bari*

Indirect detection is a method where the analyte is not directly measured but rather properties through detecting another measurable parameter or a related reaction. Photoacoustic Spectroscopy (PAS) relies on generating acoustic waves induced by the absorption of modulated light, detected using different microphones, offering advantages in sensitivity and selectivity. Innovations in PAS include advancements in acoustic detection methods and microresonators, improving signal-to-noise ratios, and miniaturization of the sensor systems. Quartz-enhanced Photoacoustic Spectroscopy (QEPAS) has emerged as a powerful and versatile technique for gas detection, exploiting new lasers and PAS. Utilizing a quartz tuning fork (QTF) as the acoustic wave detector for enhanced signal amplification, a modulated laser source is focused through the QTF prongs and two microresonator tubes, generating standing waves and enhancing the acoustic wave amplitude. Evanescent wave (EW) excitation of the gas with side-polished fibers (SPF) is a novel innovation. An EW is an electromagnetic wave that exists close to the surface of a material, created when a light wave is incident on a boundary between two materials with different refractive indices at an angle greater than the critical angle. For example, total internal reflection in an optical fiber creates an EW at the boundary between the core and cladding of the fiber. The fiber is pol- ished on one side to grant access to the EW for use as the excitation source. Using SPFs methane concentrations as low as 34 ppmv can be detected using a modulated laser source and a booster optical amplifier to increase the laser power. By coating the SPF with different materials the EW intensity can be increased to detect lower concentrations, possibly without a booster. We will describe our work on the build-up of the excitation wave using an optical resonator on a silicon nitride chip.

MoSe2-Graphene Electrochemical Sensors for Drug Detection in Aquatic Environments

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Tara Barwa [1], ***Prof. Carmel Breslin*** [1]

1. *Maynooth University*

Healthy aquatic environments are crucial to sustaining biodiversity, ecosystems and humans. However, anthropogenic activities, including the improper disposal of pharmaceutical waste, have led to the contamination of water bodies with persistent pollutants. This poses a significant threat to environmental/human health, including the risk of antimicrobial resistance, necessitating advanced sensing technologies for effective monitoring. Recent developments have brought to the spotlight, 2D materials as promising candidates for environmental sensing, due to their unique characteristics and wide-ranging applications. In particular, Transition-metal dichalcogenides (TMDs), comprising of MX_2, with M a transition metal atom e.g. Mo, W etc. and X, a chalcogen atom S, Se or Te[1], have garnered attention for their exceptional features. These materials consist of M atoms closely sandwiched between two layers of X atoms, linked by strong in-plane covalent bonds, and further bonded by weak van der Waals forces between the layers. Among the TMDs, molybdenum diselenide ($MoSe_2$) exhibits exceptional properties, including high electronic conductivity, good chemical stability and surface area. Here, we explore the potential of $MoSe_2$ by combining it with reduced graphene oxide. The $MoSe_2$/rGO composite structure was developed to assess its potential to detect dimetridazole (DMZ) in water, an antibiotic frequently used in poultry feed & treatment for bacterial/protozoal infections in humans and animals. Elevated DMZ concentrations increases the risk of carcinogenicity and antimicrobial resistance, underscoring the importance of monitoring and maintaining low environmental levels of antibiotics such as DMZ to safeguard public health. $MoSe_2$ 2D sheets were fabricated by simple and low-cost sonication-assisted liquid phase exfoliation of bulk powders in ethanol/water, and subsequently drop casted on a glassy carbon electrode. Reduced graphene oxide was then electrodeposited on the nanosheets to form a composite material on the electrode. We will show that this $MoSe_2$/rGO hybrid material has excellent potential for the development of electrochemical sensors.

Sensing and Monitoring of Airborne Real-Time Pollen

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Gemma Davis [1], ***Dr. Emma Markey*** [2], ***Dr. Jerry Hourihane Clancy*** [1], ***Dr. Moisés Martínez-Bracero*** [3], ***Dr. David O'Connor*** [1]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *Met Eireann,* ***3.*** *University of Córdoba*

This research aims to modernise the pollen monitoring infrastructure in Ireland, by introducing real time monitoring using the Swisens Poleno and comparing it to the already established Hirst sampler. Using pollen data that was collected from previous years, updated pollen calendars were constructed for the benefit of individuals afflicted with hay fever. The Swisens Poleno device was subjected to a diverse range of pollen types in order to develop a comprehensive database for the purpose of pollen detection and identification. The Swisens Poleno device provides the capability to acquire real-time data on pollen concentrations. The utilisation of modelling techniques will be employed to determine the origins of pollen in Ireland, which will, in turn, make environmental monitoring operations easier to accomplish. Development of a sophisticated pollen forecast model specifically for Ireland will be created by integrating traditional, real-time, and meteorological parameters so that pollen concentration will be able to be predicted. This research represents a significant leap forward in pollen monitoring. The study improves our understanding of the dynamics of airborne pollen by comparing the Hirst and Swisens Poleno samplers and making use of sophisticated modelling techniques. Improvements in public health and environmental management are anticipated as a result of the findings, which are applicable to individuals who suffer from allergies, healthcare professionals, and environmental scientists.

Keywords: Pollen, Real-time monitoring, Environmental Monitoring, allergens

The Irish Atmospheric Simulation Chamber: A national facility for atmospheric sciences

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Amir Ben Brik [1], ***Prof. Andy A. Ruth*** [2], ***Dr. Satheesh Chandran*** [2], ***Dr. Mixtli Campos*** [2], ***Prof. John C. Wenger*** [1]

1. *Centre for Research into Atmospheric Chemistry, School of Chemistry, University College Cork,* ***2.*** *Centre for Research into Atmospheric Chemistry, School of Physics, University College Cork*

The Irish Atmospheric Simulation Chamber (IASC) was established in the Centre for Research into Atmospheric Chemistry at University College Cork (UCC), Ireland to enable the study of fundamental atmospheric processes and to quantify parameters needed in air quality and climate models. This national research infrastructure consists of a custom-built Teflon chamber (~27 m^3), supported in an aluminium frame, and surrounded by a temperature-controlled enclosure containing 140 UV lamps with an intensity comparable to solar irradiation. Standard parameters such as temperature, pressure, relative humidity, and CO_2 mixing ratios are continuously monitored.

The facility is also equipped with a range of instruments for continuous measurements of relevant atmospheric gases (NO_x and O_3 monitors) and particles (SMPS). For other gases such as organic compounds and products of oxidation reactions, the facility employs a Time-of-Flight Chemical Ionization Mass Spectrometer (ToF-CIMS). Additionally, ultrasensitive optical cavities developed at UCC are used for accurate measurements of relevant atmospheric species, including NO_2, $NO_3^{\cdot}$, HONO, glyoxal (CHOCHO), methylglyoxal (CH_3COCHO), H_2O, and CO_2. With this instrumentation, the IASC can derive needed information to constrain atmospheric models and improve forecasts. It enables detailed investigations of a wide range of atmospheric processes including radical reactions, daytime and nighttime oxidation of volatile organic compounds (VOCs) and secondary pollutant formation. An overview of IASC as well as examples of trace gas detection will be outlined in the poster.

The IASC is an internationally recognized facility with involvement in European research and training networks such as EUROCHAMP-2020 and ATMO-ACCESS. The technological potential of IASC makes it attractive to the international research community as well as private sector users. The versatile nature makes the IASC an ideal test bed for the development, testing and benchmarking of new atmospheric monitoring technologies and sensors. Collaborations with industry and international atmospheric scientists have been established and are further envisaged.

From the West Coast to the East: BioBeo Schools and the Circular, Sustainable and Ecological Bioeconomy

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. James Lowry [1]

1. *Maynooth University*

This abstract outlines the field work of a doctoral researcher in the BioBeo Research Unit at Maynooth University. BioBeo is the Horizon Europe-funded education project introducing new approaches to enhance understanding and engagement across society regarding circularity and the bioeconomy. This research explores the bioeconomy concept in a diverse set of schools (an island school off the west coast, a school on Dublin's eastern shore, a midland's Gaelscoil, a large urban primary school in the Lake county and a Special school near the Hill of Tara). BioBeo's educational purpose is to enhance understanding and engagement across society regarding sustainability, circularity, and bioeconomy.

The research explores BioBeo's five bioeconomy themes (Interconnectedness, Outdoor Learning, Life below Water, Food Loop, and Forestry) with children in the outdoor classroom. The six outdoor learning workshops include sensory, ecological, and experiential learning activities, resulting in the children planting a mini woodland of broadleaf native trees, 'An Choillín Beag', construction of a wildlife pond, planting of a food garden with an abundance of pollinator-friendly bulbs and wildflowers, culminating in exciting days in classrooms without walls for a deepening awareness of ecological interconnectedness in their own places of learning and community.

From the school workshops, the work continues to place the findings in the broader scientific, environmental, educational and philosophical landscape. What has been witnessed is the children gaining in confidence, and emerging as active and empowered citizen-scientists through exploring the circular, sustainable and ecological bioeconomy. Taking concrete and confident steps, their little hands deep in the soil and in water, embracing climate action without anxiety, and caring for their local community of living things in our shared home, the Earth.

A child reflected wistfully in the 'Life Under Water' workshop, how she had never seen a frog in 'real life'. This can still be turned around.

Cities2030 EU project Supports Local policy initiatives in the South East region in Urban Green Space Use: An ongoing pilot study for Community Gardening Initiatives to Supplement Households and Communicate Proactive Environmental Behaviours.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Dr. Christina O'Loughlin [1], ***Ms. Aileen Drohan*** [1], ***Ms. Frances Cleary*** [1], ***Ms. Hazel Peavoy*** [1]

1. *SETU Waterford*

Cities2030 an EU Horizons funded project (20 countries, ~40 cities) uses multi actors and territorial approach to generate sustainable **C**ities and **R**egional **F**ood **S**ystems (CRFS). It is committed to the transformation of our food systems. Creating an Observatory, open access platform that provides information about CRFS based on blockchain technology, fed by living laboratories, piloting regional specific projects with community-driven solutions. Walton Institute (SETU), the Irish partner identified a Green Party private party bill as a pilot initiative for Waterford City. The bill proposes use of public greenspaces for Community Gardens. Cities2030 is currently administering an anonymous household survey (N=500) in the South East on Food Choices, Sustainability, Climate Action, Community/home gardening and foraging using a trusted local supplier of fresh free-range eggs. Interim results from a sample of 61 households (expected ~150/500) show that 77% are over 50 years, 72% are female and 79% live with partner/family and/or children. 69% are currently employed/homemakers, 26% retired and 3% students. The top 3 food-use concerns are Health & Nutrition (57%), Cost & Affordability (49%) and Food Waste (34%), while the main reason for household food waste are expired/best-before dates (53%), busy lifestyle/change of plans (49%) and excess purchasing (26%). 79% believe that climate change is an urgent global threat and 38% say that they do not understand the science behind it. The main obstacles to making changes are affordability/cost (66%); Inconvenience to every-day life/habits (66%) and lack of knowledge (54%). 71% are motivated and engaged to make every-day changes, 44% feel some degree of powerlessness and 30% believe that individual actions will have little impact nationally or globally. 75% would consider community gardening and 43% food foraging to supplement their food usage. These preliminary findings suggest widespread support for Community Gardening initiatives which will positively inform the upcoming FSD event.

Examining the Drivers that Shape Sustainable Consumer Behavioral Intentions of Regional Leisure and Visiting Friends and Relatives (VFR) Passengers in the Irish Aviation Industry.

Tuesday, 26th March - 12:35: (Room FO1, Tramore Lecture Room, SETU, Waterford) - Poster

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Amy Whelan [1]

1. *SETU Waterford*

The research will explore the underlying factors that drive sustainable leisure and VFR travel in order to contribute to the achievement of the United Nations Sustainable Development Goals (SDGs).The SDG's were adopted by all United Nations Member States in 2015 as a call to end poverty, to protect the planet and to ensure that all people enjoy peace and prosperity by the year 2030.

Individuals are becoming increasingly concerned about environmental, social, and economic issues, and are willing to act on those concerns. This heightened awareness of their environmental footprint has prompted individuals to re-evaluate their purchasing behaviours, often showing a greater willingness to invest in products and services that possess eco-friendly attributes. Consequently, businesses have been compelled to reassess their sustainability efforts in response to this shifting consumer landscape. While passengers may possess a moral obligation to lead sustainable lifestyles, their ability to do so effectively relies on the support provided by governments, non-governmental organisations (NGOs), and the businesses they engage with. Thus, while individuals and passengers alike may recognise the significance of sustainable consumption, the translation of this awareness into actual sustainable consumer behaviour is not always straightforward.

Therefore, this research seeks to understand passengers attitudes and behavioural intention towards sustainable aviation and travel and examine the attitude-behaviour gap in sustainable tourism and aviation in Ireland. Specifically, this mixed-methodology research will:

1. Explore the topic of sustainable travel and impact this has on Leisure and Visiting Friends and Relatives (VFR) travel segments.
2. Explore the drivers of sustainable travel within the context of leisure and VFR travel.
3. Propose a model that will act as a framework for understanding sustainable travel behavioural intention throughout the travel related consumer decision making processes.
4. Provide a deeper understanding of sustainable travel drivers and implications for travel and tourism related marketers.

Consequences of agricultural grassland management intensity on soil microbiome-mediated nutrient cycling potential in Ireland

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Karla Burke [1]***, Dr. Achim Schmalenberger*** [2]***, Dr. Stefanie Schulz*** [3]***, Dr. Andreas Luescher*** [4]***, Dr. Fiona Brennan*** [1]***, Dr. Aaron Fox*** [1]

1. *Teagasc, Environment Research Centre, Johnstown Castle, Co. Wexford,* ***2.*** *Department of Biological Sciences, School of Natural Sciences, University of Limerick,* ***3.*** *Helmholtz Zentrum Munich, Research Unit Comparative Microbiome Analysis, Munich,* ***4.*** *Forage Production and Grassland Systems, Agroscope, Zurich*

The Irish Government's FoodWise 2025 and the European Union's Farm to Fork and Biodiversity 2030 initiatives emphasize the need to urgently develop nutrient-efficient grassland systems. Enhancing the capability of the soil microbiome to undertake soil ecosystem functions has enormous potential to influence soil nutrient turnover, improving the efficiency, resilience and sustainability of grassland systems to meet the projected increase in demand for food production, while reducing its environmental impacts. In this project, the principal scientific objective is to provide novel insights into how agricultural grassland management intensity influences the turnover of essential macronutrients for plant growth and soil health, specifically nitrogen, carbon and phosphorus. Both focused field experiments and regional-scale surveys, will be undertaken to examine this. These will specifically focus on the influence of the following aspects on microbiome-mediated soil nutrient cycling potential in grasslands; 1) the presence of specific plant species in grasslands 2) temporal effects due to different management events and changing weather conditions throughout the growing season and 3) drought events. The project will utilize a multidisciplinary approach to study the plant-microbiome interface under field conditions, encompassing agronomic, botanical, microbiological and biogeochemical aspects. This research project represents a critical next-step in the research area, as the majority of studies in grassland systems have focused on examining microbial community structure only. This work goes further by examining the functional capabilities of the soil microbiome and their realized function in relation to soil nutrient cycling, with the aim to informing the sustainable management of Irish agricultural grasslands.

Effect of sward type, composition, and farming system on earthworm populations

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Seán Nagle [1], ***Prof. Helen Sheridan*** [1], ***Prof. Olaf Schmidt*** [1]

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In recent decades, perennial ryegrass (*Lolium* perenne, PRG) has been the predominant grass species sown on Irish farms. This is due to its potential high productivity when managed under high rates of nitrogen (N) fertiliser inputs. This has led to high yielding PRG monocultures replacing diverse permanent pasture, thus contributing to declines in farmland biodiversity. The EU Biodiversity Strategy 2030 aims to reverse this trend, while the Farm to Fork Strategy has committed to reducing fertilizer use by 20% by 2030. Multispecies swards (MSS) have demonstrated their capability to produce increased quantities of herbage dry matter relative to PRG while receiving reduced levels of nitrogen fertiliser. Previous research has also shown that earlier slaughtering dates can be achieved in calf to beef and sheep systems with MSS relative to PRG. However, less information is available regarding the biodiversity support potential of these grass-, legume- and herb-containing swards, relative to grass-legume or grass-only swards. As part of the Multi4More project (https://multi4more.ie) we aim to determine the effect of three different sward types on earthworm populations: 1) PRG monocultures; 2) PRG and white clover (*Trifolium repens*) (PRGWC); and 3) multispecies swards; PRG, timothy (*Phleum pratense)*, white clover, red clover (*Trifolium pratense*), chicory (*Cichorium intybus*), plantain (*Plantago lanceolata*). Earthworm populations are being sampled in spring and autumn, in two years, across six sites located in the east and south-east of Ireland. Sites are managed under a range of ruminant production systems as part of livestock experiments on research farms; dairy, sheep, suckler weanling to beef, and dairy heifer/bullock calf to beef. Rapid dynamic extraction of earthworm samples is being undertaken using allyl isothiocyanate. Collected samples will be identified to species level. Provisional data, based on 221 samples across 6 sites, indicates a significantly higher earthworm biomass in MSS and PRGWC than PRG monocultures.

Effects of plant functional group diversity on dry matter yield across three sites in Ireland

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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The global agriculture sector relies heavily on synthetic nitrogen (N) fertiliser to increase crop yields. However, N fertiliser is associated with multiple environmental challenges, which underscores the need for innovative and sustainable alternatives. One promising solution is the use of multispecies grassland mixtures, comprising grasses, legumes, and herbs with complementary traits. The Multi4More project (https://multi4more.ie), funded by DAFM/DAERA, is a collaborative project between AFBI, Teagasc, UCD and TCD. A common experiment was established in 2023, across three participating sites. The overarching goal of the common experiment is the optimisation of species composition to reduce N inputs while maintaining herbage dry matter yields and enhancing environmental effects. Proportions of six grassland forage species (two grasses, two clovers, two herbs) were systematically varied to create a gradient of plant diversity within each of the different N fertiliser levels (0, 75, 150 and 300 kg N ha−1 yr−1). During the establishment year of 2023, herbage dry matter yield was measured for part of the year at all three sites. Preliminary results show that at 75 kg N ha−1 yr−1, multispecies swards yielded more herbage dry matter yield than perennial ryegrass by +5.8%, +0.9% and +6.9% at Lyons Estate, Crossnacreevy and Johnstown Castle, respectively. Results will include comparisons of yields across different N treatments and species composition at the three sites.

Controlled Environment Agricultural Systems (CEA); future sustainability metric design and role for biodiversity regeneration.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mrs. Michelle Farmer [1]

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On the 3rd of December 2023 at COP28, The Food and Agricultural Organisation (FAO) announced the first-ever Health Day for the first time in COP's 28 years. It recognises the infinite links between global climate change and its impact on human health. Concluding that nutrition and climate change are intrinsically connected. The CEA (controlled environment agriculture) could be the answer: indoor farming without the constraints of the natural environment's variations. The CEA spans several orientations (exclusively internal), using carefully selected LED lighting and a temperature-controlled environment paired with nutrient-dense fertilisers (Hoagland's) to generate sustainable, highly nutritious food per kg/kWh.

The industry is still in its infancy with no regulatory body, resulting in contrasting metrics in energy usage, water, and waste. Fertiliser is a critical component in the artificial system; however, the "eco-toxicity potential" has been 'deprioritised' compared to traditional agricultural methods and quantities required. The Haber Bosch (HB) process "fixes" nitrogen at high pressure and temperature; globally, the fossil-fuel-based process generates 2.9 tonnes of carbon dioxide (CO^2) released for every tonne of NH□. The costs of which also fluctuate with the cost of natural gas. Global research is underway in renewable energy sources for the HB process, but research is needed targeting fertiliser use efficiency. This research focuses on the inputs and outputs of CEA farming to generate consistent metrics towards SDG goals for energy, biodiversity, and waste management and how the CEA could benefit soil porosity regeneration.

Keywords: Biodiversity, sustainable farming, regeneration, SDGs, CEA, waste management.

Linking the anaerobic and aerobic methods for predicting potential mineralisable nitrogen to the microbiome involved in soil organic matter turnover

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Yahaya Jebril Amanor [1], ***Dr. Nabla Kennedy*** [2], ***Dr. David Wall*** [3], ***Dr. Fiona Brennan*** [4]

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Soil organic matter (SOM) is a major plant nitrogen (N) source. How much of this SOM-N can be supplied to plants via N mineralisation is key to enhancing agricultural sustainability. The 7-day anaerobic and short or long-term aerobic incubations are widely used biological methods for measuring potential mineralisable N (PMN). However, under temperate grassland conditions it is unclear how soil processing (i.e., soil drying) and incubation temperatures affect PNM prediction using the 7-day anaerobic method. Further, little is known about the active microbial groups associated with the PNM methods. To address these research gaps soil samples were collected from 9 management systems consisting of grass, grass-legume and grass-legume-herb swards at three locations in Ireland: Johnstown Castle (Co. Wexford), Lyons farm (Co. Kildare) and Curtins Research farm (Co. Cork). Anaerobic PNM was measured at two incubation temperatures- 20^{o}C (In20) and 40 ^{o}C (In40) using three pre-incubation soil conditions- fresh, 20^{o}C dried (D20) or 40 ^{o}C dried (D40) soils. Long-term (35 weeks) or short-term (4 weeks) aerobic PNM was measured at 20^{o}C using fresh soil. Molecular soil samples were collected to measure active microbial groups under each method. Preliminary results from this ongoing study show that initial mineral N levels changed with pre-incubation soil condition. Fresh and D20 soils showed similar mineral N levels, however, both had higher values than D40. The anaerobic PNM changed with both incubation temperature and pre-incubation soil condition. PNM increased with incubation temperature such that the values for fresh and D20 at In20 were always lower than fresh, D20 and D40 at In40. Nonetheless, for either incubation temperatures, PNM for the three pre-incubation soil conditions followed the trend fresh < D20 < D40. These early results suggest both pre-incubation soil condition and incubation temperatures are critical considerations when making recommendations for the anaerobic PNM method in grasslands.

Identification of Irish Cattle as potential reservoirs of extended spectrum β-lactamase producing Enterobacteriaceae (ESBL), and carbapenemase producing Enterobacteriaceae (CPE)

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Mairead Quinn [1]

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AMR is very prevalent within the agriculture sector especially within food producing animals which are involved in intensive production. The careless use of antimicrobials has contributed to the extensive dissemination of AMR bacteria within animal adjacent environments. This practice has led to an unprecedented rise in AMR and multi-drug resistant (MDR) bacteria. As the public health threat of AMR reaches crisis point, the future of routine antibiotic use becomes untenable. The study aims to assess-

- The prevalence of the CPE, ESBL Fluoroquinolone within Irish cattle
- The ability of the AMR Enterobacteriaceae to persist in slurry samples exposed to winter and summer conditions

The detection of AMR and MDR was split phenotypic and genotypic methods. Both methods of analysis were employed within the study including, selective agar, antimicrobial susceptibility testing (Kirby Bauer), MALDI-TOF MS, and PCR. The samples analysed were fresh faecal and slurry sourced from Irish cattle herds, both dairy and suckler.

Initial phenotypic findings have detected CPEs (22.3%), ESBL (21.8%) and fluoroquinolone (5.8%) resistance within slurry and fresh bovine faecal samples (N=175). Many of these samples displayed MDR (6.7%). The summer slurry samples demonstrated AMR for 3 months and winter samples continue to display AMR.

Enterobacteria have been classified by the WHO as severely drug resistant bacteria due to extensive production and dissemination of CPEs and ESBLs which supports these initial results. As this is the first study of its kind within Ireland, these are worrying results as MDR may be more prevalent than first anticipated.

Key Words: AMR, Agriculture, Irish Cattle herd, One Health

Variations in microbial properties associated with nitrogen mineralisation are more strongly associated with season than sward type in agricultural grasslands

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Yahaya Jebril Amanor [1], ***Dr. Nabla Kennedy*** [2], ***Dr. David Wall*** [3], ***Dr. Fiona Brennan*** [1]

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Conventional grass monocultures require high fertiliser nitrogen (N) inputs for optimum productivity. But fertiliser N has low recovery, often leading to environmentally damaging N losses to air and water. Multispecies swards (i.e., grass-legume-herb mixtures) have been suggested as alternatives for grass monocultures since they can produce comparable yields to grass monocultures, but with lower N inputs. This is partially achieved by enhancing N fixation but also possibly by promoting greater N release from soil organic matter via microbial N mineralisation. However, there is lack of empirical data to support this hypothesis. The current study assessed the seasonal changes in microbial properties associated with N mineralisation under multispecies, grass monoculture and grass-legume swards. Three experimental trials on different soils in Ireland (Johnstown: Gley soil; Curtins: Brown earth; Lyons: Gleyic brown podzol) were sampled in autumn, winter, spring and summer. Soils were analysed for potential N mineralisation (PNM), microbial biomass C and N (MBC, MBN) and activities of three C and N cycling enzymes (β-glucosidase, BG; Leucine aminopeptidase, LAP; and N acetyl glucosaminidase, NAG). Microbial properties were largely affected by season. Across the three sites, PNM was 1.1 to 1.7 fold greater in spring and summer, compared to the other seasons. This was likely due to warmer and more favourable growth conditions in spring and summer. MBC, MBN and enzymatic activities increased in spring and summer, but also in autumn. Regardless of sward type or season, microbial properties were up to 2.4 (PNM), 5.6 (MBC), 2.3 (MBN), 1.7 (BG), 1.9 (NAG), and 1.7 (LAP) times higher in the lighter and freer draining soils of Curtins compared to the poorly draining soils of Lyons and Johnstown. Overall, these results show that microbial properties responded more strongly to seasonal changes than sward type, and that the seasonal effects were also controlled by site differences.

Quantifying baseline organic carbon stocks in agricultural soils of Ireland for monitoring the impact of land use systems on soil health

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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1. *Teagasc,* ***2.*** *University College Cork*

Over the years, soil organic carbon (SOC) has proven to be one of the most determining indicators of soil health, the continued capacity of soils to function as a vital living ecosystem that supports plants, animals and humans. High-carbon soils are well structured and fertile, providing habitats for organisms and supplying sufficient nutrients and water for food production. Additionally, carbon sequestration mitigates the environmental impacts of greenhouse gas emissions. However, agricultural labors are affecting the capacity of soils to store carbon, compromising the sustainability of agro-ecosystems. The present work analyze the impact of different land use systems on SOC stocks. To achieve this, Teagasc is leading the Signpost Program, a multiannual sampling campaign dedicated to build an accurate baseline of SOC stocks that will improve the carbon accounting framework for sustainable agriculture. Soil sampling will be conducted on ~100 farms. To date, 37 farms have been covered. Combining GIS techniques and catena approach, four sampling sites are selected for each farm, capturing multiple combinations between climatic regions, landscape positions, soil types, and land management regimes. Soils samples are taken at four depths (15, 30, 45, and 60 cm) using different methods. Samples from pits provide reference values of carbon stocks and soil health indicators, while composite sampling using cores records the natural variability of those properties within each site. Measurements include physical-chemical indicators like pH, potassium(K), phosphorus(P), total nitrogen(N), total carbon(C), organic carbon(SOC), aluminum(Al), calcium(Ca), and Magnesium(Mg), bulk density and texture (clay, silt, and sand content) calculated by spectroscopy. Finally, SOC stocks across P scenarios, C/N, and C:N:P ratios are estimated to understand the capacity of soils to supply nutrients and store carbon. Signpost initiative emphasizes management practices with long-term benefits for the environment, improving overall soil health to support progression of sustainable agricultural systems.

The influence of soil structure on chemical and physical mechanisms of phosphorus release

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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The influence of soil structure on the availability and release of legacy soil phosphorus (P) stores is not fully understood. Consequently, there are limited options available to improve mining of P reserves, and current recommendations are based predominantly on soil chemistry. The hypothesis of the present research is that poor soil structure impedes change 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 is being examined through a pot trial. The aim is to study the influence of contrasting soil structures on build-up and draw down of soil P, across low to high P indices. Soil of varying soil test Morgan's P values was collected, air dried, and sieved. Each soil was packed into pots at three different bulk densities. Perennial ryegrass was sown and rooting was allowed to establish over a 6 month period to encourage structural development. After the priming period (2022), baseline measurements of Morgan's soil P were taken in spring 2023. Treatments of draw-down and build up rates of P will be applied over two years. Soil P is measured annually to detect trends in P build-up or drawdown. Herbage measurements will be taken at intervals typical to grazing rotations of 21 to 28 days throughout the growing season. Soil physical quality will be assessed at the conclusion of the trial in 2025. Intact soil cores will be extracted from each pot and soil water retention curves will be measured. Porosity, and physical quality will be calculated. It is anticipated that the results of this work will indicate if structural variations influence the manipulation of Morgan's soil P levels and mobilisation of P reserves.

Assessing soil health across multiple land-use types in the Northwest of Ireland

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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Soil represents an invaluable resource for Ireland, providing myriad ecosystem services that result in environmental, societal, and economic benefits. Ensuring the health of soils is an integral part in achieving climate neutrality, renewing biodiversity, and providing food. The Geological Survey Ireland (GSI) led Tellus programme has compiled a large dataset of geophysical and geochemical properties for soils across Ireland, providing an excellent baseline for the determination of soil health across multiple land-use types. This GSI Masters by Research project will complement the Tellus programme and help realise the objectives of existing EPA-funded projects focused on soil health (e.g. MMeSH, TellSoilBio). This project will do this by performing analysis of chemical and biological soil health indicators from Tellus sites. Specifically, soil CO_2 respiration, autoclaved-citrate extractable (ACE) protein, and active carbon are being measured for biological properties, and total soil organic matter (SOM), pH, phosphorous, potassium, and minor element composition are being measured as key chemical characteristics. Together, with the outputs from these projects, we aim to help generate novel datasets of biological and chemical soil health characteristics and develop new and/or validated soil health indicators for specific contexts and land uses.

Keywords: Soil health, Soil science, Geochemistry, Biodiversity, Environment, Biosignatures

Development of housing typology-based optimisation techniques for PV energy self-consumption in Irish households

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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The need for carbon-free energy in addressing the climate emergency has stimulated a global initiative to enhance the use of renewable energy sources (like solar and wind) for power generation. Solar radiation is abundant in nature, environmentally friendly and an effective sustainable energy resource to generate electricity via photovoltaic technology to overcome current energy challenges. Lately, the integration of solar photovoltaic (PV) panels for electricity generation has gained significant importance due to their potential to produce clean and renewable energy. Solar PV systems are not restricted to commercial scale power applications, they are also becoming popular in residential settings due to their economic advantages and positive impacts in reducing anthropogenic climate change, when compared to fossil fuel-based energy sources.

According to Climate Action Plan 2024, Ireland targets 51% reduction in GHG emissions from 2021 to 2030, and to achieve net-zero emissions by 2050[1]. In transitioning to climate neutral economy, Ireland aims to increase the proportion of renewable electricity generation to 80% by 2030, with a contribution of 8 GW from solar, and remaining from wind energy[1].Therefore, there is a need to switch to renewable energy generation and take measures for energy efficiency and use of on-site renewables (e.g., rooftop solar panels). The optimisation of PV technology for electricity generation and self-consumption of PV generated energy should therefore be a priority to increase overall share of renewable energy generation. On a domestic scale, PV panels are often placed on the roof and thereby limited in terms of roof space, roof pitch and housing orientation. This research will identify solutions based on Irish housing typologies, which will lead to optimise PV generated energy and self-consumption in the dwelling, while making PV a viable, attractive, and useful technology for future adoption by additional households across Ireland.

[1] “Climate Action Plan2024, Government of Ireland.”

Repurposing Yard Washings with Native Duckweeds

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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Yard washings (a.k.a. dairy soiled water), are produced on dairy farms when milking parlour's, milking equipment and the surrounds are rinsed down and cleaned. This process generates a large volume of a dilute waste stream which is often stored separately to slurry. Yard Washings are subject to tightening restrictions in regard to the storage and disposal. The cost of disposal of Yard Washings is quickly overtaking the fertiliser replacement value of Yard Washings as the price of fuel continues to increase.

Duckweed are a native aquatic plants that grow across Ireland. They are well known for their rapid growth and phytoremediation capacity. They have the added benefit of containing high levels of protein, up to 40% dry weight. Duckweed possess a similar amino acid profile to that of soybean, and has the potential to substitute it in animal feeds.

By cultivating duckweed on Yard Washings, the valorisation of a costly waste stream can occur. Duckweed can grow on the waste stream under the principals of the circular economy, taking up valuable nutrients such as nitrogen and phosphorus and producing a valuable plant biomass that contains high levels of protein. In return this can reduce the reliance on imported soybean and can prevent excess nutrient run-off into aquatic habitats.

Characterization and Comparative Analysis of Brewers Spent Grain and Distillers Spent Grain: A Comprehensive Study of Compositional Properties and Protocol Efficiencies.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Bolutito Ibikunle [1], ***Dr. Emma Smullen*** [1], ***Dr. Sinead Morris*** [1], ***Dr. John Byrne*** [1]

1. *SETU Carlow*

The Brewing and Distilling industry in Ireland is currently experiencing a resurgence, with a notable 22 % increase in microbreweries, since 2014 and a € 383 million increase in the Global Value Added (GVA) by the Irish whiskey industry, between the years 2015-2019. Approximately, 350,000 tons of Brewer's Spent Grain (BSG) and Distiller's Spent Grain (DSG) are produced annually in Ireland.

This study provides a comprehensive analysis of the compositional properties of BSG and DSG, both of which are valuable by-products in the brewing and distilling industry. Protocols were implemented to achieve accurate and reliable results for the physico-chemical properties, such as: protein, moisture, starch, fat, ash, cellulose, hemicellulose and dietary fibre.

This research study aims to contribute to current efforts directed at better utilisation of brewing and distilling by-products for various applications, including biofuel and value-added products. Pre-liminary results showed a fat content value of 10.19 % and 8.28 % for BSG and DSG, respectively which corroborated with existent literature. Starch content results obtained for BSG and DSG were 33.97 % and 27.42 %. Additional investigations may be necessary to aid understanding of the variations in composition content and the implications for the potential applications of both grain types. The results presented here serve as a foundation for future research in the utilisation of spent grain waste generated in the brewing and distilling industry.

CircBioCityWaste: Upscaling Organic Waste Streams to Fertiliser Products and Bioenergy Though Cascading Biorefinery Approach

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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The CircBioCityWaste initiative centres around the foundational concept of the 'circular bioeconomy,' with a primary focus on sustainable and resource-efficient utilization of anaerobic digestion (AD) treated urban biowaste streams. These waste streams in focus are the organic fraction of municipal waste (OFMSW), dairy and wastewater treatment plant sludge digestates, which then would be bio-transformed to obtain platform chemicals, bioenergy, biostimulants and organic fertiliser products in line with the EU-FPR 2019. By focusing on an 'end-of-waste' approach, the project aims to producing deliverables for sustainable agriculture, promoting plant growth, and improving soil health through the cascading approach. The biorefinery process encompasses digestate collection, characterization, development of pre-treatment methodologies, and the implementation of innovative green extraction technologies to recover agrochemicals and biofertilizers. The feasibility of organic acid production from organic fractions will be explored through microbial fermentation, while all the residues diverted to low temperature fluidized bed combustion and other hydrothermal technologies to obtain green energy alongside biochar and mineral rich ash fertiliser. To gauge the effectiveness of both biostimulants and biofertilizers, comprehensive assessments using pot trials with model and commercially significant plants are carried out. Furthermore, the CircBioCityWaste project will evaluate the sustainability of the multiproduct biorefinery, examining the economic, social, and environmental impacts of the developed products and processes through life-cycle assessment. This holistic approach aims to provide a thorough understanding of the potential for harnessing urban waste as a valuable resource for a sustainable and circular agroeconomy.

Key words: Anaerobic digestate, circular economy, biobased products, biorefinery, biostimulant, biofertiliser

Creating value from waste; a circular economy approach to seafood processing wastewater

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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Seafood processing industries generate significant volumes of wastewater containing organic pollutants, suspended solids and nutrients. These wastewaters pose environmental challenges, and to avoid negative impacts on the environment, expensive wastewater treatment is required. Such treatment removes both organic matter as well as plant nutrients. Given the high energy cost of generating nitrogen fertilisers and the scarcity of mineable phosphorus, nutrient retention rather than removal has substantial environmental benefits. Duckweed, known for its rapid growth and high nutrient uptake capabilities, is a native aquatic plant that can remove nutrients from wastewater in a way that is both sustainable and economical. By using the resulting duckweed biomass as a fertiliser, feed- or even food-stock, nutrients are retained within the food chain. The EU funded IMPRESS project explores the characteristics of the wastewaters at the different processing stages of seafood, and assesses the potential of duckweed species to grow and produce valuable biomass for various applications, while simultaneously remediating the wastewater.

Expression and functional characterization of recombinant metallothionein proteins of water lettuce (Pistia stratiotes) and water hyacinth (Eichhornia crassipes) in E. coli

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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Water lettuce (*Pistia stratiotes*) and water hyacinth (*Eichhornia crassipes*) are aquatic plants native to South America and are known for their ability to hyperaccumulate heavy metals from water without showing any symptoms of abiotic stress. Phytoremediation by aquatic plants can alleviate heavy metal contamination of water bodies arising from anthropogenic activities and natural processes. This is achieved through several mechanisms including phytoextraction. During phytoextraction, the production of peptides, such as metallothioneins, has been shown to improve the plant's tolerance to and accumulation of heavy metals.

Metallothioneins (MTs) are gene-encoded polypeptides that have highly conserved cysteine-rich motifs contributing close to 30% of the polypeptide chain. Studies have shown that MTs participate in various heavy metal tolerance processes in plants because of their capability of chelating and sequestering heavy metal ions such as zinc, copper, and cadmium using thiol groups present in cysteine residues. In our study, novel putative MT genes from *P. stratiotes* and *E. crassipes* were identified using bioinformatics and PCR, and gene expression analysis showed upregulation of proposed MT from *P. stratiotes* exposed to copper. To further improve our understanding of the function of novel putative MT genes from *P. stratiotes* and *E. crassipes*, the work presented here focused on optimizing recombinant MT protein expression in *E. coli* and investigating functions of MTs by means of increase in tolerance and accumulation of copper by transgenic *E. coli* harbouring putative novel MTs. Optimum conditions for recombinant soluble MT protein production in *E. coli* were observed, and an increase in tolerance and accumulation of copper by transgenic *E. coli* was confirmed. Characterizing of novel MT sequences is crucial for eco-engineers aiming to effectively utilize *P. stratiotes* and *E. crassipes* for alleviating heavy metal contamination in water.

Carbon emission reduction strategies for sustainable cement production

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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Climate change and environmental degradation are an existential risk to the world and Europe. To overcome these challenges, on 10 March 2020, the European Commission laid the foundations for an industrial strategy that would support the twin transition to a green and digital economy, make EU industry more competitive globally, and enhance Europe's open strategic autonomy. The European Green Deal will transform the EU into a modern, resource-efficient and competitive economy, by ensuring no net emissions of greenhouse gases by 2050 and economic growth decoupled from resource use.

The cement industry is responsible for 8-10% of CO_2 emission and 7% of industrial fuel consumption. Cement clinker production represents the lion share of emissions, thus this area offers most opportunities for CO_2 emission cuts. Reduction in energy consumption and carbon emissions during cement manufacturing can be achieved by low clinker cement i.e., partially replacing clinker with supplementary cementitious material (SCM). Our study indicated that the use of a cheap, easily accessible and widely spread material, shale (clay) as SCM could potentially reduce CO_2 emissions from manufacture of cement. Mining of primary natural resources are an indispensable part of our consumeristic society. Tailings represents one of the highest volume residue streams, with a production of approx. 700 Mton/year in Europe. The Cement Paste Backfill (CPB), utilize the storage of up to 60% of the tailings which can be backfilled into abandoned parts of the mine. We are exploring carbonation curing of the CPB during its preparation that will not only help in improving the compressive strength but will also allow sequester large volume of CO_2 in the abandoned parts of mines.

Development of greener and more sustainable lipase catalysed synthesis of carbohydrate fatty acid esters

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

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1. *SETU Waterford,* ***2.*** *TU Dublin*

Carbohydrate fatty acid esters (CFAE), classified as biosurfactants, have gained significant interest due to their antimicrobial and antitumor properties and potential for development from renewable and/or circular materials. Their synthesis involves both chemical and enzymatic methods with the challenge in chemical synthesis of harsher conditions and wasteful processes. Enzymatic catalysis offers advantages in safety profile, environmental considerations and selectivity of reaction. In considering development of these methods a holistic approach is needed, incorporating green chemistry principles at every synthetic stage.

A comprehensive approach was undertaken for the development of a greener lipase catalysed synthesis of methyl 6-O-dodecanoyl-α-D-glucopyranoside, utilizing methyl α-D-glucopyranoside and lauric acid as model compounds. The study explored alternative, classical and non-classical greener solvents. The investigation tested their impact on the reaction and the regioselectivity profile. Process optimization also involved variation of heating and stirring method, temperature, time and ratio of reactants. A developed quantitative NMR analysis provided a detailed insight into the reaction, expanding analytical screening methods applicable in CFAE synthesis. Recycling of enzyme was investigated. The substrate scope was broadened by synthesizing monoesters of α and β methyl D-glucopyranoside, functionalised with medium to long chain unsaturated fatty acids to develop a panel of CFAE products for anti-microbial evaluation. A greener workup procedure was developed to isolate product, utilizing H_2O, EtOAc, and *n*-heptane, reducing solvent waste compared to flash chromatography. The green credentials of the proposed synthetic route were evaluated using the Chem 21 metric toolkit. In summary, this study centred on enhancing the synthesis of CFAE through the application of greener solvents, improved energy efficiency processes, analytical techniques, purification processes, and expanded substrate scope.

Development and Analysis of Deep Eutectic Solvent based Formulations for Transdermal Drug Delivery of Model Therapeutics

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Joseph Anim Boadu [1]***, Prof. Helen Hughes*** [1]***, Dr. Ariane Perez-Gavilan*** [2]***, Dr. Claire Lennon*** [1]

1. *Pharmaceutical and Molecular Biotechnology Research Centre, South East Technological University, Waterford.,* ***2.*** *Department of Applied Science, South East Technological University, Carlow.*

In response to the limited solubility of numerous pharmaceuticals in conventional solvents for drug delivery systems, often restricted by toxicity and stability concerns, this research addresses the pressing need for novel and environmentally friendly solvents. The project aims to investigate a range of deep eutectic solvents, renowned as greener solvents, for their impact on the solubility and stability of poorly soluble pharmaceuticals, particularly those with low bioavailability. By employing Green Chemistry and Sustainability principles, the project will identify pharmaceutically relevant solvents with minimal environmental impact by assessing their ability to solvate a model compound such as resveratrol, their biodegradability and toxicity. At its core, the study seeks to identify the optimal solvent system that balances drug solubility and bioavailability with environmental considerations. Improved drug solubility not only potentially lowers the required drug dosage but also minimizes waste generation and decreases energy demand for production. Furthermore, the selected solvent system will be studied for its ability to facilitate transdermal delivery of both small drug molecules and peptides using microneedle technology. The transdermal route is beneficial as it circumvents the first-pass effect typically associated with the traditional oral route. While the study is currently in its initial stages, focusing on the synthesis, characterization and evaluation of neoteric solvents, it represents a significant step toward addressing challenges in drug solubility. This project addresses the critical need for innovative solvents and drug delivery systems that minimize environmental harm while maximizing therapeutic efficacy. By leveraging neoteric solvents and sustainable practices, we aim to advance pharmaceutical formulations towards safer and more effective treatments, ultimately benefiting both patients and the environment as a whole.

Extraction of Active Substances from Green Tea and their Incorporation into Phytosomes to Improve Stability, Bioavailability and Permeability for Diabetic Wound Healing Application

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Syeda Attiqa Tajammal [1]***, Dr. Shiau Pin (Graece) Tan*** [2]***, Dr. Austin Coffey*** [3]

1. *School of Science and Computing, South East Technological University,* ***2.*** *South East Technological University,* ***3.*** *Technological University of the Shannon*

It is well known that green tea extract (GTE) have a wide range of bioactive activities, including potent antioxidant, anti-inflammatory, antibacterial, and wound-healing processes that are accelerated by angiogenesis and an anti-fibrotic action. *In vivo* wound healing and scarring were found to be considerably improved by the polyphenols in green tea (such epigallocathecin gallate (EGCG)) (Xu, et al., 2021). While several researches have demonstrated these qualities both *in vitro* and *in vivo*, very few have included the extract in a formulation for a wound dressing as presently, no green tea wound dressings are available in the market.

The aim of the project is to utilise natural bioactives from GTE into a sustainable wound dressing for enhanced wound healing effect. The first step of the project is to incorporate the GTE into nanosystem to protect it from degradation caused by environmental factors i.e., air, light and pH, allowing them to have a sustained effect in the wound dressing. This is achieved by incorporation of GTE in phytosomes usingthin film hydration technique. Phophatidylcholine was chosen due to its potential to interact with polyphenols to encapsulate GTE. Percentage encapsulation of GTE was found to be 29.9±2.35% and FTIR analysis showed effective incorporation of GTE in phytosomes as demonstrated by the chemical interactions between GTE and Phosphatidylcholine. By using agar well diffusion and disc diffusion testing techniques, green tea extract and respective phytosomes formulations showed antimicrobial activities against non-pathogenic *Staphylococcus aureus* with inhibition zones of 13.38±0.449mm and 16.68±0.188mm respectively. These wounds dressing will be an all natural, sustainable dressing as the compound of interest itself has been used widely in human consumption, making their toxicity very low, and less likely to have extensive toxicity problem in future clinical trials.

Key words: Green Tea Extract (GTE), epigallocathecin gallate (EGCG)), Phytosomes

“Biological degradation of synthetic plastics- Enzymes as potential catalysts for Polyethylene Terephthatlate (PET) recycling”

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Rozina Rozina [1], ***Dr. Tracey Coady*** [1]

1. *SETU Waterford*

Plastic consumption has surged over the past half century due to versatility and affordability, with projections indicating that it will double in the next twenty years. Polyethylene terephthalate (PET) is the third most produced polymer worldwide, followed by polyethylene (PE) and polypropylene (PP). The synthesis of PET occurs through transesterification of dimethyl terephthalate and ethylene glycol, or direct polycondensation of terephthalic acid and ethylene glycol. This study highlights about microorganisms and enzymes which can break down plastic waste into monomers like terephthalic acid (TA) which can be used to biosynthesize polyhydroxyalkanoate (PHA), a biodegradable polyester. This recycling technology converts PET plastic bottles into PHA, upcycling plastic waste into a useful bioplastic. Microbial enzymes that have potential to degrade PET are majorly lipases and cutinases, the combined action of both enzymes synergistically improves the overall PET hydrolysis process. This study seeks to highlight two potential solutions: biodegradation and upcycling. We will explore microbial and enzymatic approaches to measure the biodegradation rate of PET. The screening of microbial isolates will be performed to identify those capable of efficiently degrading PET under various conditions by optimizing pretreatment methods and reaction parameters to increase PET biodegradation rates. In addition, we will demonstrate how the monomers produced from PET depolymerization can be used as feedstock to biosynthesize new value-added biodegradable polymers like PHA. Moreover, all the methods will be used according to green chemistry principles. The current study aims to promote a circular economy framework for PET by enhancing a more sustainable and greener world with an innovative green technology.

An investigation into Engineering skills and values; how they contribute to global responsibility, and the UN Sustainable Development Goals.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mrs. Charlene Clinton [1]

1. *Ulster University*

Engineers play a key role in societal development. Their ability to solve complex issues through innovative solutions makes engineers key stakeholders in the race against climate change. Over the last two decades, a paradigm shift in attitudes globally has expedited the climate agenda, particularly for businesses and Higher Education Institutions (HEI's) which are uniquely positioned to provide technical support and knowledge transfer in helping to shape climate policy.

The field of education is ever-changing, as are the skills required to be life-ready when graduating. However, literature suggests that HEI's are not uniform in the delivery of the engineering curriculum, particularly course learning outcomes aligned to the SDG's. There is a collective effort necessitated across HEI's to transform engineering education from a focus on technical problem-solving to a holistic approach to sustainable development. This study investigates *'How embedded are SDGs in engineering education?'*, *'What skills and values are required to meet the SDG's?'* and *'Can values in engineering be measured?'*.

Methodology

Stage one; a content analysis has been undertaken on engineering revalidation documents (2014-2020) at a leading UK university. The findings set a benchmark to compare sustainability content in engineering courses across the UK. **Stage two;** in seeking to understand moral judgements of next-generation engineers, this study will utilize the 'Engineering Science Issues Test' developed by Borenstein et al. (2014). **Stage three** draws upon methodological approaches in the field of psychology, applying 'Eye Tracking and Electroencephalogram Technology' to measure engagement responses to information, attitudes, and preferences in decision-making.

Contributions

First, shedding insights into self-efficacy in engineering students, sustainability knowledge and the skills gap in engineering. ***Second,*** the psychological aspects of engineering individuals' values. ***Third,*** a methodological contribution applying eye tracking and electroencephalogram technology to assess engineers' values. ***Fourth****, an* educational contribution investigating 'problem-based learning' as an effective engineering pedagogy.

Enacting Education for Sustainable Development in Trinity: a students-as-partners approach to incorporating Sustainability into the curriculum

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Cicely Roche [1], Sarah-Jane Cullinane [1], Freddie Fallon [1], John Gallagher [1], Tom Hegarty [1], Felix Mexxanotte [1], William Reynolds [1], Maryam Yabo [1], Carlos Rocha [1]

1. *Trinity College Dublin*

Education for Sustainable Development (ESD) stands as a key objective for both the Irish Government and Trinity College Dublin (TCD). Trinity's interdisciplinary ESD team, comprising five Academic Fellows and four student interns are developing strategies to incorporate sustainability into the curriculum. This study outlines the process and value of students-as-partners in co-creating and beta-testing several interactive workshops that fit within a module titled *'Enacting Education for Sustainable Development in Trinity'*. This module will target novice level learners, aligning with TCD's broad curriculum goals and bridges pedagogical knowledge. Insights are captured from feedback during the beta-testing process undertaken between November 2023 to January 2024. Scenarios and cases used within the workshops aimed to resonate with both students and staff, with the goal of maximising the likelihood that curriculum fosters a deeper connection to the subject matter for future students. The analysis of feedback received during the piloting process will inform curriculum updates, prior to the roll-out of a full pilot later in 2024. The success of student-led workshops addressing the incorporation of sustainability into the curriculum underscores the potential for this type of approach to enable professional and personal development of interns. It also generates valuable ESD resources to support TCD's ambitions, whilst empowering the interns to become future leaders in ESD. The findings demonstrate that student leadership in workshop design enables the conceptualisation of cases that are relevant to their peers, which can increase active engagement by undergraduate students. As the demand for effective sustainable development curriculum grows in a rapidly evolving field, the significance of student-staff collaborations to maximise impact merits continued attention.

Photosynthetic responses of the seagrass Zostera marina to salinity and desiccation

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Dr. Claudia L. Cara Ortega [1], ***Ms. Kathleen McGonagle*** [1], ***Dr. Pedro Persio Beca-Carretero*** [2], ***Prof. Dagmar B. Stengel*** [1]

1. *University of Galway,* ***2.*** *Leibniz Centre for Tropical Marine Research*

Seagrasses, particularly *Zostera marina* L., are crucial to the functioning of coastal marine ecosystems, acting as key contributors to ecological stability. The widespread distribution of *Z. marina* across the Northern Hemisphere can be accredited to its remarkable tolerance to a range of salinities and temperatures. These adaptive qualities are essential to its survival among various stressors such as periods of air exposure, alterations in light conditions, and human impacts like eutrophication - all of which affect its physiological processes, notably photosynthesis. This, in turn, has implications for its role in carbon uptake and sequestration.

As part of the BlueC.ie project which investigates the carbon sequestration capabilities of Irish seagrass ecosystems, this has study focused on the spatial differences in the productivity and physiological attributes of seagrasses along environmental gradients. The research specifically evaluates how ecologically relevant air exposure (0 to 48 h), and varying salinity levels influence *Z. marina* photosynthetic parameters both in their natural habitat and under controlled laboratory conditions. Measurements of chlorophyll fluorescence were assessed via rapid light curves and monitoring of selected parameter such as non-photochemical quenching (qN), maximum electron transport rate (ETR_{max}), and the maximum quantum yield of photosystem II (F_v/F_m); in addition, relevant biochemical compounds (e.g., Chl *a*) were determined. The findings underscore the significant role that both salinity fluctuations and air exposure play in affecting photosynthetic parameters which, in turn, are fundamental to the health, productivity and survival of seagrass in Irish coastal waters, directly contributing to ecosystem functionality across natural environmental gradients.

Assessing the soil carbon storage and GHG emissions of grasslands using the DNDC model

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Dr. Xiaoyi Meng [1], ***Dr. Ibrahim Khalil*** [1], ***Prof. Bruce Osborne*** [1]

1. *UCD School of Agriculture and Food Science, University College Dublin, Belfield, D04 V1W8 Dublin, Ireland*

As an integral carbon sink with the capacity to mitigate global climate change, the global significance of the grassland ecosystem has been extensively documented. Carbon sequestration within biomass and soils makes grasslands effective carbon sinks, although these ecosystems are associated with substantial emissions of greenhouse gases (GHGs), specifically methane (CH_4) from livestock and nitrous oxide (N_2O) from soils. To comprehensively evaluate the environmental sustainability and mitigation potential of grasslands, it is therefore important to weigh up the benefits derived from their role as a carbon sink against the detrimental effects of enhanced GHG emissions.

In this study, we employed a process-based model, the Denitrification-Decomposition (DNDC), to estimate the fluxes of major GHGs within a long-term grassland silage experiment. Utilizing daily weather data, soil properties and soil management specific to the study sites as inputs, the DNDC model simulated the dynamics of N_2O, CO_2, CH_4, water-filled pore space (WFPS), soil temperature, biomass, and soil organic carbon. Parameters related to plant growth, such as maximum biomass production, C/N ratio of plant tissue, and accumulated thermal degree days, were tailored based on local observations to align with the adaptation of the DNDC model for the grassland environment. The coefficient of determination (R^2), root mean square error (RMSE), and modeling efficiency (EF) were used to assess the DNDC model based on the measurements. The DNDC model successfully captured the N_2O emissions and soil temperature. To gauge the potential impact of climate change on grassland ecosystems over the next three decades, we employed a baseline scenario alongside various climate change scenarios. This approach will enable us to estimate the anticipated effects of current and future impacts on ecosystem carbon dynamics, thereby contributing to a more nuanced understanding of the intricate interplay between grassland ecosystems and climate change.

Keywords: grasslands; carbon sequestration; DNDC model; climate change

Role of Tree Diversity in Mediating Drought Effects in Forests under Elevated CO2 and Warming

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Mr. Tim Coffey [1]***, Prof. Jennifer McElwain*** [2]***, Dr. Grace Cott*** [3]***, Dr. John Devaney*** [1]

1. *Maynooth University,* ***2.*** *Trinity College Dublin,* ***3.*** *University College Dublin*

Increasing tree diversity in planted forests has been shown to enhance ecosystem services such as wood production. Ireland is missing its decarbonisation targets and ambitious afforestation plans form a major part of Ireland's climate mitigation strategy. Over half of Ireland's forests comprise of monoculture Sitka spruce plantations and diversification of Irish forests is a key component of national forest policy. We know little about how tree diversity-ecosystem function relationships will materialize in future climates. Short, extreme events, such as sudden drought, have been shown have impact ecosystems more negatively than smaller changes over sustained periods of time. While there is some evidence showing how tree diversity responds to mean drought, little is known about how tree diversity will respond to variable drought conditions. Understanding interactions between tree diversity and climate change will aid the design of climate-smart forests in Ireland and internationally. Using seedlings grown in mesocosms in growth chambers, Future Forests will examine tree diversity-ecosystem function relationships over three years in response to combinations of increased temperature and atmospheric CO_2 under severe drought, measuring above- and below-ground responses. Four species commonly occurring throughout Ireland will be used: *Alnus gultinosa* (alder), *Betula pubescens* (birch), *Fagus sylvatica* (beech) and *Quercus robur* (oak). In year 1, experiments will examine tree diversity-ecosystem function relationships in response to combinations of increased temperature (reference 1981-2000 temperature and control +2°C) and drought (average precipitation (1981-2000) and extreme summer drought). In year 2 drought variability will be tested (i.e. low variation in water supply vs high (±40%) variation). Using state-of-the-art growth chambers, experiments in year 3 will examine the effect of increased atmospheric CO_2, in combination with increased temperature and variable drought, on tree diversity-ecosystem function relationships. Knowledge provided by Future Forests will inform policy-makers and foresters on future afforestation strategy to mitigate effects of climate change.

Monitoring Environmental Resilience in Northern Ireland: The Importance of Legislation in Managing Wastewater Discharges Impact on the Environment

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Hayley Corbett [1]***, Dr. Brian Solan*** [1]***, Dr. Svetlana Tretsiakova-McNally*** [1]***, Prof. Pilar Fernandez-Ibanez*** [1]

1. *Belfast School of Architecture and the Built Environment, Ulster University, UK*

Modernisation of treated discharges and their disposal is crucial to effectively manage water quality to protect public health and the natural environment. This poster discusses pollution within the Neagh-Bann River basin, Northern Ireland (NI), and considers the imperative role of government policy in sustaining robust water monitoring practices for the discharge of wastewater to surface waters. It also reviews the occurrence of contaminants of emerging concern (CECs) in the United Kingdom (UK). Regulations from the European Water Framework Directive (2000/60/EC) are transposed into NI law for continued operation of legislation post-Brexit, and include a 'Watch List' of priority CECs such as ubiquitous, persistent, bio-accumulative and toxic substances (uPBTs), and antimicrobials contributing to Antimicrobials Resistance (AMR). October 2022 saw a proposal for the Urban Wastewater Treatment Directive (1991/271/EEC) with new demands on systematic monitoring of AMR, among other reforms. However, reference data is needed to inform these policies. Clear surveillance thresholds, with timescales, are markedly absent from current legislation. Furthermore, studies of NI waterway quality are limited, and their comprehensive investigation is often neglected by UK-wide reports. A case study of nutrient pollution in the Neagh-Bann River basin is presented, and preliminary findings revealed indications of pollution, where physio-chemical testing results were in breach of legislative standards. Most recent reports have also shown that all NI waterbodies failed to achieve "good" quality status, a decrease from 33% of waterbodies achieving "good" quality status in 2015. This is despite goals set in 2015 by government advisors to improve overall quality by the end of 2021, highlighting the need and relevance for further research in this area. This work addresses contaminant detection gaps and challenges associated with outdated infrastructure, which hinders progress toward Sustainable Development Goals. As urban and industrial discharges metamorphose to the 21st century, wastewater management and monitoring must become proactive.

An investigation into the infiltration of Persistent, Mobile, and Toxic as well as very Persistent very Mobile chemicals in surface water.

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Rebecca Smith [1], ***Mr. Alexander Savelev*** [1], ***Dr. David O'Connor*** [1], ***Prof. Fiona Regan*** [1], ***Dr. Susan Hegarty*** [2]

1. *School of Chemical Sciences, Dublin City University,* ***2.*** *School of History and Geography, Dublin City University*

As the negative effects of pollution on the environment and health begin to emerge and become apparent, an emphasis is being placed on controlling and reducing the volume of contaminants entering water systems. Historically, persistent chemicals have been highlighted as major concern as they remain in the environment for long periods, occurring in various forms. Persistent, mobile, toxic, and very persistent, very mobile chemicals, known as PMT/vPvM chemicals, are the latest chemical group of concern as described in the EU's REACH legislation.

Limited research has been conducted into the behaviour of PMT/vPvM chemicals in the aquatic environment. This particularly interesting given Ireland has one of Europe's most decentralised populations, with a large proportion of rural inhabitants dependent on private wells and group water schemes as their primary water source. Here, human health is particularly at risk as Irish Water carries out no water quality testing whatsoever on these systems, deferring to local governments. Consequentially, water treatment is not stringent resulting in contaminated groundwater.

This research focuses on agricultural and pharmaceutical sources of PMT/vPvM chemicals, as these sectors are known as major polluters within Ireland. A ranked prioritisation list of PMT/vPvM compounds were selected from the 'REACH' registered substances list based on their potential hazard to both the environment and human health within Irish water. GIS modelling will be used to understand the effects of the selected PMT/vPvM compounds on the aquatic landscape by identifying major pathways, allowing the creation of water catchment area maps and watershed analysis to develop robust monitoring programmes. Various GIS modelling techniques will be used to improve the data collected, highlighting at-risk areas based various factors. From this research, several recommendations and conclusions will be drawn for future Irish legislation and research planning, creating the most effective PMT/vPvM solution possible to protect the most at-risk areas.

A Temporal Assessment of Antimicrobial Resistance in the Environment (TARE

Wednesday, 27th March - 14:30: (Atrium, Outside Auditorium, SETU, Waterford) - Poster

Ms. Julie O Donovan [1], ***Dr. Jean O'Dwyer*** [2]

1. *School of Geography, Archaeology and Irish Studies, and Ryan Institute, University of Galway. Irish Centre for Research in Applied Geosciences, University College Dublin, Dublin, Ireland,* ***2.*** *University College Cork*

One of the biggest global threats to human health is Antimicrobial resistance. The TARE project assesses

- The impact of the shift in Irish agriculture - from a traditional crop/pasture rotational system to modern and intensive pastures and
- The impact of human sewage discharge on both faecal pollution (via E. coli) and the antimicrobial susceptibly profiles of faecal bacteria in the aquatic environment.

This will be investigated by obtaining representative core samples collected using a piston corer spanning the last ~ 80 years from the 3 basins of Lough Muckno Co. Monaghan, a lake influenced by significant urban and agricultural environmental pressures. E. coli will be cultured at depth intervals in each core and antimicrobial susceptibility analyses on the cultured E. coli isolates will be performed, producing a high-resolution and chronologically constrained record of antimicrobial resistance (AMR). TARE aims to increase our scientific understanding of the historical and current levels of faecal pollution, and concurrently AMR in an anthropogenically impacted surface waterbody and identify the trends, drivers and mediating factors which lead to AMR development. Results will provide a critical evidence-base for informing current and future policy relating to environmental pollution and human health. TARE is the first study to assess the evolution of antibiotic resistance from a spatiotemporal perspective in an environment impacted by both human and agricultural waste.

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