University of Limerick Sustainability Report 2022

SUSTAINABLE DEVELOPMENT GOALS

UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH

Contents

President's Foreword

We are at an existential moment where **our decisions and choices** determine peace and coexistence, planetary health and the survival of all life on Earth.

Universities are at the forefront of knowledge creation, acquisition and sharing. They are idea factories and think tanks where modified and new value propositions emerge and are tested, where models of practice are piloted and probed, and where future-looking mindsets and repertoires of skills are shaped. Universities serve as foundries of engaged citizens, future leaders, disruptors and pioneers. Through education, research and knowledge exchange, they transform people's lives and act as change agents in the specific contexts they are embedded in.

UL has always been committed to enabling our students to become engaged and socially responsible citizens – individuals who can create positive impact both within the region, in Ireland and across the globe. We are building on this commitment by wholly aligning ourselves to the UN Sustainable Development Goals. September 2022 saw UL take the first tangible steps to becoming a truly sustainable university with the launch of the collectively developed UL Sustainability Framework 2030.

The Framework advocates a mission-based approach that aligns with much of the work currently being undertaken within the EU and internationally. The Framework will act as a bedrock for our decisions and actions to shape the future of higher education, research and the organisation itself. It connects with so much of what has already been pioneered by and in UL but also looks to build new capabilities, encourage more experimentation and give rise to more evidence on campus with the overall aim of enabling UL to become a sustainable university through and through.

Sustainability has to become evident across all aspects of our campus. It must be an integral part of our ethos, our governance and our leadership. It needs to guide our research and shape our students' experiences. It ought to exist at the core of our partnerships and collaborations. Most importantly, it has to become an integral part of our home and community life – allowing us to lead the way and inspire the next generations of leaders.

Ambitious goals such as these cannot be achieved in isolation; they are too grand for any single individual, team or discipline to tackle alone. Instead, they require a commitment to fostering meaningful collaborations so we can envision the world we wish to create and live in and to spark the desire to act in solidarity for peace, for resourcefulness and for the sustainability of all life on Earth. It is our responsibility to take bold actions – to have the courage to explore the unknown and to collectively pioneer a better and more just path forward.

Kerstin Mey
President
University of Limerick

Director's Foreword

University of Limerick builds on existing momentum and signals intent to become a **'truly sustainable university'**

Preparing for the UL 50 celebrations gave us an opportunity to stand at the crossroads between UL's past achievements and what we could be and do in the next 10 years. While reflecting on this, we were fully cognisant of the urgent need to contribute to a local, national and global paradigm shift towards achieving a collective culture of sustainability in line with the United Nations Sustainable Development Goals (UN SDGs). A sustainable world will not happen without a determined effort – our actions today shape our world of tomorrow. To become a sustainable university, we must start by acknowledging that true sustainability will require permanent adaptive responsiveness to ongoing change.

As a first step towards achieving our ambition, we set up a cross-organisational Sustainability Working Group to bring together the voices and actions of over 70 individuals – all committed to sustainability – from across UL. As the group worked to translate the UN SDGs, we started by identifying four high-level higher educational challenges to support our transition: governance, the economy, society and the planet. Inspired by the work of economist Mariana Mazzucato, we adopted a mission-based approach to enable collective action across the campus. We co-designed a set of 21 UL sustainability missions inspired by our four grand challenges. The missions are bold and ambitious and serve as a starting point for guiding collective action. Each mission is underpinned by a set of declarations, which are statements describing where we hope to be in 2030.

Over the coming years, we will work with the campus community to deliver on our portfolio of sustainability missions. Some missions are already underway, and others will be launched over the coming years. Some are very ambitious while others build on work that is already happening in UL. We will learn as we go, shaping and reshaping our missions in a collective endeavour to become a truly sustainable university.

Andrea Deverell
Director
Centre for Sustainable Futures and Innovation

Student Sustainability Coordinator's Foreword

In today's fast-paced world, the global community faces a myriad of economic, environmental and societal challenges. From climate change to resource depletion, **the need for sustainable solutions has never been more urgent**. At the forefront of this battle for a more sustainable future are the students of today, who possess an unwavering passion for sustainability, and a profound understanding that they hold the key to a better tomorrow.

In pursuing a sustainable future, the UL Sustainability Working Group set forth a clear objective: to actively engage and empower students as leaders in sustainability. To turn this vision into reality, the Centre for Sustainable Futures and Innovation has placed student-led sustainability at the heart of its mission, introducing the role of Student Sustainability Coordinator. This role is designed to provide a student-centric approach that fosters co-creation, cultivates essential skills for tackling complex sustainability challenges, and propels the university's mission-driven approach to realising a thriving future.

It is our ambition that UL becomes a global epicentre for sustainable innovation and environmental stewardship. At the heart of this vision lies the recognition that fostering student engagement is paramount to achieving transformative sustainability goals, and this has led to the creation of UL Student Sustainability, a student-led programme supported by the Student Sustainability Coordinator to deliver sustainability to the students of UL.

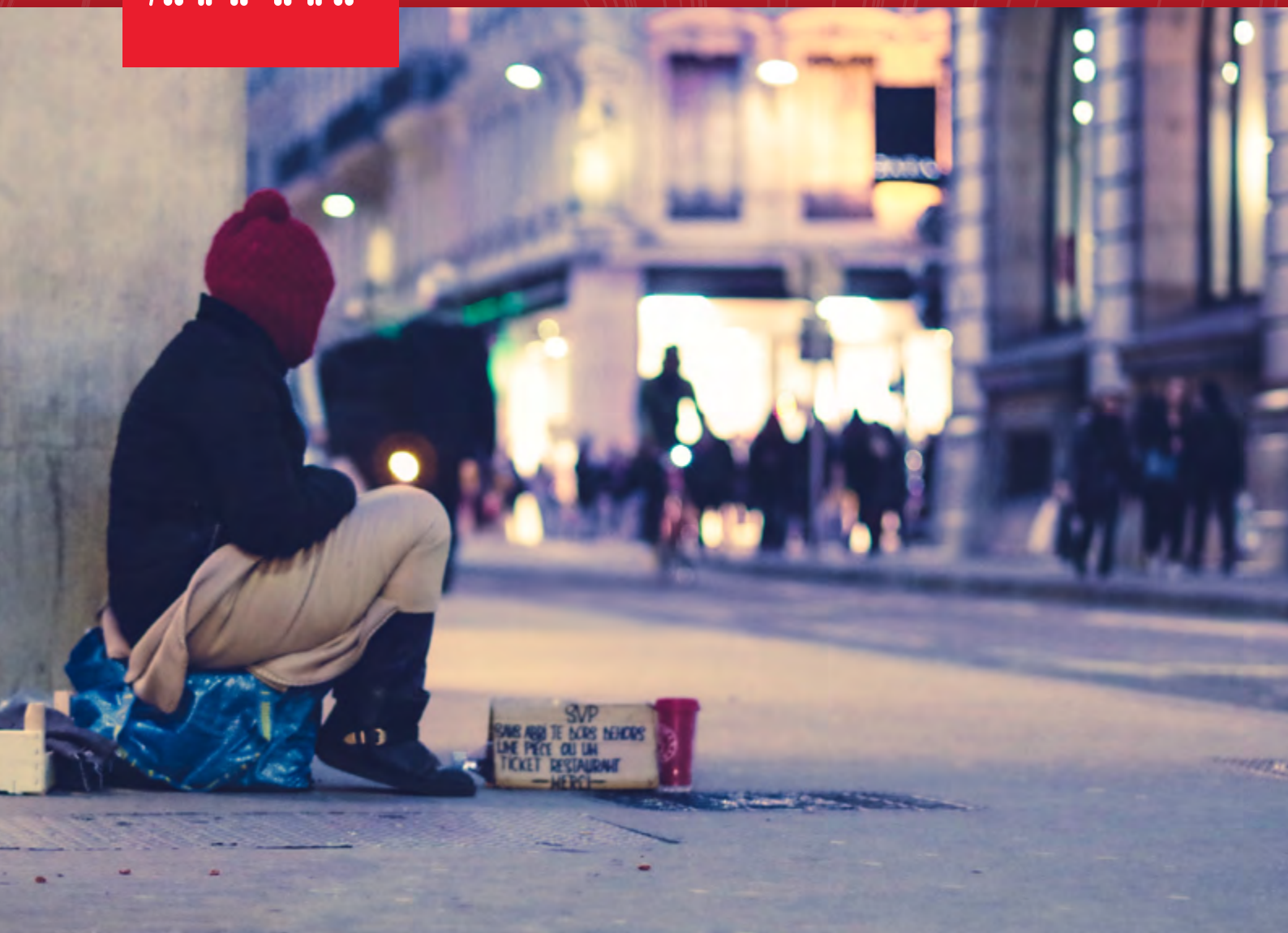
The pioneering team of UL Student Sustainability embarks on a crucial mission to establish the bedrock of a student sustainability programme, striking a balance between personal and professional development and an enjoyable student experience. Committing to a new idea is never easy, particularly when juggling academic responsibilities, part-time employment and extracurricular commitments. Thus, heartfelt appreciation is extended to the inaugural cohort of Student Sustainability: Enola Bouvenot, Ríona Gillespie, Niamh McLoughlin, Katie McNicholas, Matthew Murray and Ciara O Flynn. Their courage to take the plunge and their unwavering dedication to shaping the university's student sustainability experience forms the cornerstone of this transformative endeavour.

As we navigate the complexities of a rapidly changing world, it is essential that universities recognise the potential of student involvement in sustainability. By investing in the education and empowerment of our future leaders, we lay the groundwork for a sustainable future. The vision of student engagement at UL sets out to inspire and develop a generation of students to rise to the challenge and create a better, more sustainable world for all.

Jack O'Connor
Student Sustainability Coordinator
Centre for Sustainable Futures and Innovation

End poverty in all its forms everywhere.

1 NO POVERTY



Unmasking welfare discourses: Examining Ireland's 'Welfare Cheats Cheat Us All' campaign

Along with UL colleagues Dr Martin J. Power and Professor Eoin Devereux (Department of Sociology, Faculty of Arts, Humanities and Social Sciences), Dr Majka Ryan (Department of Work and Employment Studies, KBS) examined a specific public campaign by the Department of Social Protection in Ireland. Entitled 'Welfare Cheats Cheat Us All', the campaign encouraged citizens to report welfare fraud. The repeated circulation of anti-welfare discourses has served to encourage limited and often incorrect public understandings of issues pertaining to welfare. Central to these processes is the social construction of notions of 'deservedness' and 'undeservedness'. Dr Ryan's research sought to examine the shaping of the campaign, including the dominant discourses evident in the campaign itself and the in-house discussions in the lead-up to it. The study showed that the campaign rehearsed a familiar international discourse that follows distinct patterns or rules and provided evidence of the spurious nature of the data being used to exaggerate the scale and extent of welfare 'fraud'.

Addressing financial insecurity: Collaborative research on persistent resilience and poverty alleviation

Professor Deirdre O'Loughlin is collaborating with Dr Caroline Moraes of the Centre on Household Assets and Savings Management (CHASM) to explore the enduring effects and recurrent nature of crises such as austerity and COVID-19. The project highlights the critical importance of investigating financial insecurity and the need to develop innovative strategies and policies to help support financial equality and welfare and alleviate SDG 1, No Poverty: End poverty in all its forms everywhere. The study aims to investigate, identify and compare household and stakeholder perspectives on the nature and extent of current financial insecurity in post-austerity UK and Ireland at a time when both countries begin to emerge from the global pandemic.

Professor O'Loughlin and colleagues are currently editing a book on the challenges of poverty and the political measures that perpetuate it. The book adopts a cross-disciplinary approach to covering relevant theories, methodologies and policy-oriented research and highlights the interlinkages between poverty and austerity that have resulted since the global financial crisis. The book presents quantitative and, in particular, qualitative studies in the contexts of food insecurity, unemployment, homelessness, modern slavery and poor health. The book explores the impacts and responses relating to poverty and austerity and considers implications for key areas, including social policy, marketing and consumption, economic policy and public health. Through her research, Professor O'Loughlin has sought to advance current resilience theory in marketing through developing persistent resilience from a context of austerity-influenced consumption.

Professor O'Loughlin and colleagues have developed a new conceptualisation of persistent resilience, which differs from previous conceptualisations that focused on people's ability to 'bounce back'. Their research argues that the longevity and range of deprivations of austerity imposed following the global financial crisis require a different conceptual base from which to analyse people's behaviours.

Professor O'Loughlin is the 2022 International Research Fellow with CHASM in the University of Birmingham.

Evaluating housing first in Ireland: UL research sheds light on implementation and client well-being

An interim report of an evaluation of housing in Ireland by UL researchers was made available to the Housing First National Implementation Group, which was tasked with preparing the new National Implementation Plan. The research team included Dr Ronni Greenwood, Dr Steven Byrne and evaluation team members Aimen Kakar, Sara O'Donnell, Deirdre Leyden and Sarah Carew, with additional contributions to the interim report by Branagh O'Shaughnessy.

The evaluation comprised two primary components: a) a process assessment of the effectiveness of service coordination and delivery in each of the nine homelessness administrative regions with a focus on fidelity to the Housing First model; and b) an assessment of clients' well-being on a range of social, health, mental health and substance use indicators.

So far, the evaluation team has conducted 47 interviews and nine focus groups with team members and stakeholders in each of the nine regions. The evaluation team has completed 109 questionnaires and 15 in-depth interviews with clients across the nine regions. Clients' key workers also contributed provider assessments for each client who completed a questionnaire with the team (n=145).

The study included designing tracking tools, designing and implementing a process for collecting and collating data, providing biannual summary reports, supporting sites to carry out fidelity assessments, evaluating progress of the Housing First national programme and writing a substantial summative evaluation report on the health and tenancy outcomes and implementation of the programme.

Findings from the evaluation indicate that Housing First programmes are operating with a high degree of fidelity in each of the nine homeless regions. Vulnerable individuals with substantial histories of rough sleeping and emergency accommodation usage are getting housed, staying housed and receiving choice-driven and individualised care to support them on their recovery journeys.

Recommendations from the study include increasing the supply of one-bedroom units, providing timely access to psychological supports and treatment for dual diagnosis clients, training team members in trauma-informed care and ensuring they are competent in creating psychologically informed environments, and prioritising service user involvement in future programme development plans.

The report's conclusions and recommendations have contributed to the preparation of the National Implementation Plan. They will inform the rollout of the new programme as well as its ongoing monitoring and performance.

Commuter Hub launched to further support UL students

UL Student Life launched a morning 'Commuter Hub' to support students who commute to UL. The initiative was launched in response to the rising number of students being forced to commute on a daily basis due to the national accommodation crisis.

Operating from 8am to 9am, Monday to Wednesday, the Commuter Hub offers students a place to shelter and chat and provides free tea, coffee and breakfast for the students to enjoy before they start their day.

Speaking on the launch of the Commuter Hub, UL Student Life President Maeve Rutledge said, "The Commuter Hub provides a space for students to come in and relax, chat to others and have some breakfast before class. The feedback so far has been phenomenal; we even saw one student saying the Commuter Hub saved them from dropping out of college."

Over 47% of students who identified as a 'commuter student' in the accommodation survey said they are commuting simply because they cannot find suitable accommodation. UL Student Life has seen a significant rise in those applying for financial aid to help with the cost-of-living crisis, particularly the cost of commuting to and from college each week. Of the commuter students surveyed, nearly 27% said they are spending between €40 and €60 a week on travel.

It is the intention of UL Student Life to expand the Commuter Hub in 2023 to meet the demand from students availing of the service.

SparkED: Empowering youth leadership and fostering sustainability

SparkED is a dynamic youth leadership programme that empowers young individuals to take control of their future and become leaders within their communities. SparkED is coordinated by students volunteering with Enactus UL, a KBS-based social entrepreneurship society that enables third-level students to make a positive impact in the local and global community.

With a focus on equipping second-level students with practical life skills for higher education and the workforce, SparkED has experienced significant growth in its impact, reaching an impressive 1,259 students across 32 schools in all four provinces. A notable achievement for SparkED is its collaboration with Uber, which has enabled 826 DEIS students from 22 schools to participate in the programme free of charge. Uber's sponsorship of €1,500 has played a crucial role in expanding access to DEIS schools, thereby increasing participation from eight schools in 2021 to an impressive 22 in 2022.

SparkED has also engaged 178 fifth and sixth-year students, including a substantial group from the Leaving Certificate Applied programme. By catering to a diverse range of students, SparkED promotes inclusivity and supports individuals at various stages of their educational journey.

Financially, SparkED has made significant strides, generating €4,495 this year alone. Non-DEIS schools have shown a remarkable 245% increase in income, amounting to €2,995, which reflects the growing recognition of the programme's value by educational institutions.

Demonstrating a commitment to sustainability, SparkED organised a competition for students to develop innovative projects addressing the UN SDGs. The competition's grand prize offered an exciting week of work experience at Uber's Limerick office. The two winners emerged from Coláiste Mhihíl, CBS Sexton Street, Limerick.

To address a crucial need identified through a pre-needs assessment, SparkED conducted a CV workshop. Prior to this intervention, only 43% of students had an up-to-date CV. SparkED established a dedicated CV team that provided personal feedback to students, which resulted in an impressive transformation. Now, 84% of students possess a professionally crafted CV, equipping them for part-time employment and future opportunities.

SparkED's success story lies in its commitment to youth empowerment and sustainability-focused education. Through strategic partnerships and unwavering dedication, SparkED is shaping a brighter and more sustainable future by nurturing young leaders poised to make a positive impact in the world.

Giving Voice

"Sustainability can only be successful if we start to set our priorities differently and if we try to change the way people think about it. This can be achieved through education and good example. The key to lasting change lies in raising awareness at a young age. This means that we need to start teaching the SDGs from Junior Infant level to Leaving Cert level and show our future leaders how important every little step can be. (An 'SDG-week' for primary schools for all levels, at least every two years, could have an enormous impact."

Anita Barmettler, Language Teacher and Lecturer, School of Modern Languages and Applied Linguistics

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

2 ZERO HUNGER

Nourishing change: Exploring food poverty and the potential of social grocery stores in Ireland

Dr Majka Ryan of the Department of Work and Employment Studies, KBS conducted research to explore food poverty in Ireland from the perspective of the users of a Mid-West Simon Community food bank and to gauge whether the food bank should be expanded to include a social grocery store. The function of social grocery stores is to offer a wide range of food products (such as vegetables, meat, fish, cheese) at reduced prices in addition to the products that are already offered, free of charge, through the existing food bank. The research included a survey of 131 food bank users and interviews with 29 participants.

The goal of this second phase of the research was to explore the everyday subjective realities of those who avail of food bank services, their reasons for availing of food charity, whether the service fulfils their food needs and the impact of the service on their grocery shopping requirements. The study found that most food bank users reported needing to avail of food support due to low income and, for a significant proportion, due to disability and unemployment. For others, the need arose from their small pension, high rent, social welfare being refused or cut down, sickness, and caring for a family member. In terms of accessing food, over half of the survey participants periodically experience insufficient access to food. Interviewees reported struggling financially due to their income being disproportionate to the prohibitive cost of living, and all reported having limited ability to purchase food. All interviewees expressed interest in shopping in a social grocery store. In their view, the ability to purchase food at discounted prices would have a positive impact on the quality and quantity of accessible food and the freedom to choose what they eat. They spoke about the ability to save money and how it would afford them an opportunity to buy clothes for their children and take them on holidays. Interviewees also argued that if they were able to shop at discounted prices, they would not have to avail of a soup kitchen, which they found degrading.

UL research develops new food production process to help reduce heart disease

UL researchers created a new step-by-step guide to designing functional foods. Functional foods not only provide nutrition but can also positively affect bodily functions and so act like medicine. A study led by Daniel Granato, Professor in Food Science and Health at UL, has shown how these functional foods can help reduce atherosclerosis and other forms of heart disease.

“The capacity for our food to do more than provide us with nutrition is huge and relatively unexplored. Cardiovascular diseases are a main cause of death but they can be prevented. By bringing food scientists, medical scientists and pharma companies together, we can employ the same methods used in producing medicinal drugs and produce foods that might mitigate health conditions or diseases”, explained Professor Granato. “In this study we propose an accurate computational approach to design tailored functional foods by predicting their bioactivity, allowing us to map how different food components benefit the body.”

As the primary cause of cardiovascular diseases, atherosclerosis contributes to more than 33% of annual deaths globally. Westernised dietary patterns, a high prevalence of overweight and obesity, and an increased incidence of glucose intolerance and type-2 diabetes are related to atherosclerosis. However, despite consumers looking for functional foods to reduce the risk of cardiovascular diseases, few are available in the marketplace. This study addresses the importance of improving people’s quality of life and lowering the risk of cardiovascular disease. The study will enable the design of functional foods to prevent and treat many different diseases, potentially reducing the huge pressure experienced by health services in treating future diseases.

Professor Granato, who leads a research team in food chemistry at UL’s Bernal Institute, explained that “This contribution offers a ‘proof of concept’ that structure-based or ligand-based drug design approaches can be used and that food and pharma companies should consider for developing new foods and nutraceuticals.” Dr Andreas Grabrucker, co-author and senior lecturer in the UL Department of Biological

Sciences, added, "The proposed approach can go far beyond heart diseases. It will be the basis of a new UL research project that aims to identify functional foods that lower the risk for neurodegenerative disorders such as Alzheimer's disease."

Involving researchers at UL's Bernal Institute; the Federal University of Alfenas, Brazil; and Universidade Federal de Minas Gerais, Brazil, the study has been published in the world-leading journal *Trends in Food Science & Technology*.

The use of novel software to access sustainability indices of food products and their impact on consumer dietary choices

UL has partnered with Nutritics, an Irish-owned dietary analytics company, to assess the carbon output of foods available through UL food retailer Aramark.

GoGreenRoutes is a European-funded project that aims to assess the impact of nature-based solutions on health. Research for the project includes many elements, including highlighting the carbon footprint of dietary intakes, promoting sustainable food production and consumption and lowering the impact of emissions from our diet by making sustainable food choices.

Firstly, a survey was conducted to determine consumer attitudes to sustainable diets and to assess the motivators and barriers to consuming such a diet. Secondly, focus group research assessed what sustainability means to consumers; questions about food sustainability were posed to the groups in an open-ended manner so that each participant could elaborate on their definition of the topic.

Based on this research, GoGreenRoutes will pilot a project to employ innovative software to investigate if consumers' food choices are influenced by the availability of sustainability information (including carbon emission ratings, water and land use) provided at the point of sale in food retail outlets on the UL campus.

Nutritics has created the software FoodPrint to be used in the proposed research to assess the carbon output of foods available at commercial partner outlets on the UL campus. According to Dr Laura Kirwin, Sustainability Lead at Nutritics, consumer research is "the compass that guides eco-labelling in the hospitality and food service sector towards a sustainable future. By understanding the needs and preferences of consumers, we can develop effective strategies to drive demand for sustainable products and services. This not only benefits the environment but also creates a virtuous cycle of sustainable business practices that benefit us all."

Innovative software will be used to assess the environmental impact each food, food product and composite meal. A 'traffic-light' system will be used to indicate the environmental impact of food in the form of an environmental score (generated by taking carbon emissions, water and land use into consideration), which will be displayed at the point of sale. This enables consumers to make informed decisions regarding food choice.

This novel research aims to address the current knowledge gap regarding what is currently understood about sustainable dietary intakes and what a sustainable diet looks like in a real-world setting. For Professor Tadhg MacIntyre, Project Coordinator of GoGreenRoutes, the hope is that "new technologies will enable communities to obtain better nutritional information, leading to better and more sustainable diets as well as more sustainable communities."

Student Showcase

Harnessing heterogeneous knowledge for sustainable agriculture

Rebecca Tumwebaze

(Shortlisted for Sustainability Challenge)

Rebecca Tumwebaze, a PhD student in the Department of Management & Marketing at Kemmy Business School, will lead a project employing a bottom-up approach involving local matooke (green bananas) farmers, larger commercial farmers, agricultural specialists and government officials to develop specific frameworks to encourage sustainable agriculture practices in the Rubaya region of Uganda.

The commercialisation of agricultural production in favour of economic growth has led to widespread environmental destruction and has affected societal groups in many ways. Rebecca has identified that power and social inequalities in Uganda's agriculture sector are hindering knowledge sharing, with the effect that the knowledge held by smallholder farming communities has been being overlooked by researchers, thereby giving rise to missed opportunities for harmonious farming in partnership with nature.

For Rebecca, it was important that she became "the kind of scholar that is not just theoretical, but also very practical. I wanted to make practical contributions and see my work transforming societies", she explained. The project sought to facilitate knowledge sharing and development of context-specific sustainable agriculture knowledge in a rural community in western Uganda. Rebecca worked with the people of Rubaya sub-county in Uganda's cattle corridor as they shared knowledge on sustainable matooke farming practices within their context.

"We held workshops in both indoor and outdoor (garden) settings with diverse participants in terms of category of agriculture actor, gender, age, skill level and experience", she explained. "Participants evaluated their different practices against the sustainability attributes (environment, social and economic). Practices which were deemed the most sustainable were documented and published in a book. Copies were distributed back to the community. Through this experience, I was also able to develop the agriculture knowledge management framework which can be generalised to other contexts and utilised to enable more agriculture knowledge-sharing in rural communities. While I initially went into the field focusing on SDGs 2 and 15, the project further contributed to other SDGs (i.e., 1, 5, 10 and 17)."

Giving Voice

"I see sustainability as problem solving for a positive impact. This doesn't only mean environmentally but socially and economically as well. This generation is being provided with the opportunity to make long-lasting change in over 17 areas (the SDGs) through technology, policy change and education."

Niamh McLoughlin, Year 4 BA European Studies student

Ensure healthy lives and promote well-being for all at all ages.

3 GOOD HEALTH AND WELL-BEING

Fostering well-being at work: 'Bright Side of Work' interventions

Dr Deirdre O'Shea is one of the five founders of the international 'Bright Side of Work' research group. Comprising European leaders in workplace intervention research, the group focuses specifically on the design and evaluation of psychological interventions using daily diary research designs. These interventions focus on the when, how and for whom psychological interventions lead to improved employee health and well-being. Dr O'Shea and colleagues have published research on how mindfulness and positive activities at work impact motivation-related constructs, sleep quality and fatigue; on reducing employee exhaustion through positive reflection; and on resilience at work. In addition, Dr O'Shea contributes to the translation of this research into practice by engaging with relevant organisations, delivering seminars and workshops to industry, and liaising with the national media, radio and news outlets to promote evidence-based research on occupational health and well-being interventions. For example, Dr O'Shea presented seminars to senior civil servants and to the professional body for human resource managers.

Equality and inclusion practices in healthcare organisations

KBS lecturer and researcher Dr Nuala Ryan (Department of Management and Marketing) undertook a systematic review of equality and inclusion workplace practices in the healthcare sector. While considerable research is carried out on equality and inclusion practices in the delivery of patient care, little has been done to date to systematically review and synthesise such practices for staff in the healthcare sector. This review is designed to focus solely on staff equality and inclusion workplace practices, the evidence from which will be made available to healthcare practitioners to inform an evidence-based approach to the development of trustworthy equality and inclusion practices for their staff.

Talent management in healthcare

Healthcare systems globally are facing substantial challenges in recruiting and retaining nursing staff. The WHO states that nurses and midwives account for nearly 50% of the global health workforce and that the world is about 5.9 million short of what it needs. In response to this challenge, healthcare organisations are designing and implementing talent management frameworks – more commonly seen in the business world – to get ahead of the vacancy curve. As an integrated strategy, talent management acknowledges human capital as an organisation's greatest asset. Talent management is the effective use of focused activities to attract, identify, develop and retain individuals who are talented based on an inclusive ideology. Studies indicate that better talent management practices in the public healthcare sector can lead to positive patient outcomes, more productive staff and better return on investment. Without talent management practices, our ability to attract and retain "the best and the brightest nurses" is hindered (Elkady et. al, 2019, pp. 1).

KBS's Dr Nuala Ryan completed a stakeholder-informed, evidence-based approach to understanding and informing talent management practices for international nurses in healthcare organisations. The aim of Dr Ryan's work is to develop and complete a research study designed to inform talent management practices for international nurses in the healthcare sector as they are a strategically important group. Gathering and analysing the relevant data using this approach can help improve the performance of healthcare providers.

Optimising Irish healthcare: Research reveals efficiency insights into public hospitals

Research by the Economic Efficiency & Productivity Analysis research cluster examined the efficiency of Irish public hospitals and the ability of the system to meet the current needs of society. While spending across the Irish health sector is comparatively high, Ireland has the lowest level of hospital beds per capita in the OECD countries. The research found that Irish public hospitals operate at high levels of technical efficiency but should reduce inpatient stays in favour of outpatient visits and daily care. Such a policy approach would minimise the average length of stay and increase efficiencies around the use of resources, thereby reducing costs, at least in the short term, given capacity constraints. The research concluded that the government needs to be mindful that increasing funding to expand community services runs the risk of exacerbating the current dynamic of

an expensive general health system and an under-resourced hospital system.

Understanding how viruses evade our immune systems

UL postdoctoral researcher Dr Éanna Fennell uses unbiased RNA and protein spatial profiling assays to understand how SARS-CoV-2 and the Epstein-Barr virus (EBV) regulate and evade the human immune response. To date, Dr Fennell has focused on SARS-CoV-2 infection of the lungs and the placenta and EBV in different blood cancers.

Dr Fennell is a member of a group led by Professor Paul Murray at the School of Medicine, which was the first to molecular-profile the placenta during active SARS-CoV-2 infection. The study found multiple immune cell types had infiltrated the placenta, causing a hyper-inflammatory environment, ultimately leading to foetal demise. The work on unbiased profiling of COVID-19-infected lungs found a massive upregulation of collagen synthesis. The group tested the level of these collagens in the blood of people with active SARS-CoV-2 infection and identified a blood-based biomarker of COVID-19 severity that could be used to select candidates for anti-fibrotic drugs, which could help reduce long-term damage of lung tissue.

Dr Fennell's work on EBV – a virus that infects over 90% of the global adult population – has shown how the virus can regulate its microenvironment in cancer and reduce the efficiency of T cells in killing tumour cells. His research on EBV in cancer is funded by the Irish Research Council (IRC), while Science Foundation Ireland (SFI) funded his work on COVID-19. He received his IRC-funded PhD from UL under the supervision of Professor Jacques M. Huyghe in 2020.

Dr Fennell was awarded a Marie Skłodowska-Curie Fellowship to assess the role of EBV in the development of multiple sclerosis. He is affiliated with the School of Medicine, Health Research Institute and Limerick Digital Cancer Research Centre.

Treating traumatic brain injuries

A study by Dr George Barreto of the Bernal Institute hypothesises that the reason women may recover quicker than men after a traumatic brain injury (TBI) is due to a protein/molecule called neuroglobin, which is likely to be more expressed in the female brain and has vast protective effects in brain cells. Dr Barreto's research group found that Tibolone, a drug used as hormone therapy in postmenopausal women, increases the expression of neuroglobin, thereby giving it potential as a repurposed therapy for TBI.

Dr Barreto seeks to understand how hormones regulate our brain during adulthood and why the brain's response to damage and disease is gender dependent. With aging, women start suffering symptoms associated with menopause, a condition characterised by a significant reduction of oestradiol levels in blood. Depression, anxiety, loss of memory and cognition, sleeping problems, infections and a higher risk of developing stroke, Alzheimer's and cardiovascular diseases are attributed to the loss of protection exerted by oestradiol.

While gonadal hormones such as oestradiol and testosterone influence our brain activity throughout life, there is a need to rethink how age-related hormone loss disrupts the normal functioning of the brain with a view to implementing treatments that serve both genders.

Dr Barreto is a neuroscientist in the Department of Biological Sciences and a member of the Bernal Institute. He received €479,713 from the SFI Ireland Frontiers for the Future programme for his project entitled 'Coupling neurosciences and artificial intelligence to potentiate pharmacological actions of tibolone over neuroglobin signalling in traumatic brain injury'.

Identifying anti-thrombatic nutraceuticals to fight cardiovascular disease

Dr Ioannis Zabetakis, UL Food Scientist and Head of the Department of Biological Sciences, is formulating nutraceuticals and functional foods to prevent cardiovascular disease (CVD) using nutrients found in salmon, yoghurt and cheese. Dr Zabetakis has identified nutrients in salmon and fermented dairy foods with strong anti-thrombotic activities that inhibit platelet aggregation, thrombosis, inflammation and, hence, the onset of CVD. His research seeks to understand the links between CVD and inflammation.

According to the World Health Organization, CVD takes an estimated 17 million lives each year. The use

of statins to lower blood cholesterol in humans does not reduce cardiovascular risk. Furthermore, omega-3 supplements are ineffective against CVD. There is a clear market gap for novel products against CVD, such as supplements and functional foods, which not only provide nutrition but can also positively affect bodily functions and act like medicine.

Applying molecular engineering methodologies to continuous pharmaceutical manufacturing

Researchers at UL developed a new modelling approach to pharmaceutical manufacturing that could reduce the time required to bring medicines to market. Professor Gavin Walker of the Department of Chemical Sciences and Bernal Chair of Pharmaceutical Powder Engineering published a world-first paper in applying molecular engineering methodologies to continuous pharmaceutical manufacturing. The paper addresses the important public health issue of reducing the time required to bring new medicines to market for the benefit of patients and society.

The pharmaceutical industry recently increased its level of research into continuous manufacturing techniques to reduce the manufacturing costs of medical products, making them more affordable and getting them to more consumers more rapidly at a reduced carbon and environmental footprint. The UL research emphasises the growing significance of combining process engineering, modelling and data science to generate a better understanding of processes at a molecular scale for the optimisation of pharmaceutical manufacturing. The study was published in the world-leading general science journal *Proceedings of the National Academy of Sciences (PNAS)*.

Project lead Professor Walker explained that "This contribution offers a 'proof of concept' to make it achievable to model specific co-crystals at a molecular scale within a continuous pharmaceutical manufacturing process. . . . Molecular interactions can be altered to optimise drug properties, and this process can be crucial to the performance of a dosage form which links to the preparation of the safe delivery of the content of the drug product for the ultimate benefits of patients and society." Professor Walker added that "There is huge value in improving the productivity of the drug development process. This study expands on possibilities that exist for future development of progressing towards more supportive mechanisms in the pharmaceutical manufacturing space, improving processing and reducing time to market for new medicine."

The study was funded through CONFIRM, the UL-based SFI Research Centre for Smart Manufacturing; SSPC, the UL-based SFI Research Centre for Pharmaceuticals; and the EU's Marie Skłodowska-Curie Actions (MSCA) 'Process' COFUND.

According to Professor Walker, "The research will aid the current pharmaceutical development processes of exhaustive empirical experimentation, in that time and cost can be reduced through this more controlled and targeted approach via Smart Manufacturing techniques. . . . The paper represents a significant bridge by adapting mathematical modelling developed in the discrete manufacturing sector into effective techniques for improving continuous manufacturing within the pharma-biopharma sector." He added that "This is critical to achieve UN Sustainable Development grand challenges in good health and well-being, as well as ensuring healthy lives and promoting well-being for all at all ages, optimising biopharma processing and reducing time to market for new medicines."

Exciting progress made with biomaterials in the field of spinal cord tissue repair

New hybrid biomaterials, developed in the form of nanoparticles and building on existing practice in the tissue engineering field, have been successfully synthesised to promote repair and regeneration following spinal cord injury.

Led by Professor Maurice Collins and lead author Aleksandra Serafin, researchers at the Bernal Institute and School of Engineering have used a new kind of scaffolding material and a unique electrically conducting polymer composite to promote new tissue growth and generation that could advance the treatment of spinal cord injury. "The field of tissue engineering aims to solve the global problem of shortages of donated organs and tissues, in which a new trend has emerged in the form of conductivebiomaterials. Cells in the body are affected by electrical stimulation, especially cells of a conductive nature such as cardiac or nerve cells", Professor Collins explained.

The team describes a growing interest in the use of electroconductive tissue engineered scaffolds that has emerged due to the improved cell growth and proliferation when cells are exposed to a conductive scaffold. "Raising the conductivity of biomaterials to develop such treatment strategies typically centres on the addition of conductive components such as carbon nanotubes or conductive polymers such as PEDOT: PSS, which is a commercially available conductive polymer that has been used to date in the tissue engineering field", explained Aleksandra Serafin. "Unfortunately, severe limitations persist when using the PEDOT: PSS polymer in biomedical applications. The polymer relies on the PSS component to allow it to be water soluble, but when this material is implanted in the body, it displays poor biocompatibility. This means that upon exposure to this polymer, the body has potential toxic or immunological responses, which are not ideal in an already damaged tissue that we are trying to regenerate. This severely limits which hydrogel components can be successfully incorporated to create conductive scaffolds." Novel PEDOT nanoparticles (NPs) were developed in the study to overcome this limitation. Synthesis of conductive PEDOT NPs allows for the tailored modification of the surface of the NPs to achieve desired cell response and increase the variability of which hydrogel components can be incorporated, without the required presence of PSS for water solubility.

Hybrid biomaterials comprising gelatin and immunomodulatory hyaluronic acid, a material which Professor Collins has developed over many years, was combined with the developed novel PEDOT NPs to create biocompatible electroconductive scaffolds for targeted spinal cord injury repair. The results of a study of the structure, property and function relationships of these precisely designed scaffolds for optimised performance at the site of injury shows the potential of these materials for spinal cord repair.

New generation 3D tumour models coupled with nanomedicine strategies provide solutions for cancer metastasis

On-time diagnosis and chemotherapeutic resistance is a major obstacle to breast-to-brain cancer treatment and presents multiple challenges for optimal management of this deadly disease.

A study by Dr Nanasaheb Thorat, Department of Physics and the Bernal Institute, could lead future breast-to-brain cancer metastasis therapy. Dr Thorat's research focuses on integrating engineering and technology with biology, from the laboratory scale to systems. Among other innovations, his group at the Bernal Institute has developed various nanomedicines, 3D multicellular tumour models, and light and magnetic-field-activated point-of-care theranostics (therapy + diagnostic) devices for breast-to-brain cancer metastasis disease management.

Patients who have had chemotherapy know that as effective as it may be, it also causes damage to otherwise healthy cells. Dr Thorat's research offers a localised targeted treatment for cancer metastasis that would avoid such damage. Ninety percent of breast cancer patients die not because of the primary breast tumour but because of tumour metastasis at a different site. According to the European Cancer Information System in Europe, 950 new breast cancer patients are diagnosed and 251 deaths are recorded every day. Among all breast cancer patients, 6% of women have metastatic breast cancer when they are first diagnosed. Dr Thorat's current research addresses the breast-to-brain cancer metastasis disease management by using a targeted nanomedicine approach and profiling the metabolic mechanisms underlying breast cancer metastasis to brain to predict disease behaviour and develop novel therapeutic approaches and treatment response of aggressive breast cancer metastasis to brain.

Dr Thorat's Principal Investigator (PI) work at the Department of Physics and Bernal Institute is funded by SFI and the IRC. He is a Fellow of the Royal Society of Medicine, London.

Researching treatments for autoimmune diseases

Research carried out at the Bernal Institute identified an immunomodulatory enzyme (IME) that reduces inflammation associated with psoriasis and rheumatoid arthritis. Immunomodulators modify the activity of the immune system, thereby reducing the inflammatory response.

Dr Promita Bhattacharjee, Department of Chemical Sciences, aims to develop a new drug to treat autoimmune diseases like psoriasis and rheumatoid

arthritis by using this IME in commercially viable therapies. Dr Bhattacharjee's research could inspire the development of standard therapeutics over the next five to ten years and improve the quality of life for millions of people living with autoimmune disorders such as psoriasis.

Globally, 125 million people live with psoriasis; 6,000 people are affected with psoriasis in Ireland per annum, and this number is potentially increasing yearly. Current drugs on the market have limitations as they treat the symptoms only, and most have side effects that lead to asthma.

Dr Bhattacharjee's work is an integral part of a €5m Enterprise Ireland Disruptive Technologies Innovation project entitled 'Therapeutic enzyme as a treatment for sepsis and other immune disorder diseases' awarded to Professor Sarah Hudson of Cala Medical in 2018. The project team is working on an immunomodulatory enzyme called ScpA (A streptococcal C5a peptidase). ScpA is a bacterial protein that has the potential to decrease the inflammation associated with different cytokines (small proteins in the body that control the immune system).

Rerouting toxic protein assembly and preventing onset of neurodegenerative diseases

Dr Shayon Bhattacharya of the Department of Physics has high hopes that neurodegenerative diseases will soon become manageable.

Orderly protein self-assembly is a fundamental process in sustaining the normal functioning of cells in the human body. Yet, some of the 'sticky proteins' spontaneously turn into 'rogue' proteins that develop neurodegeneration in the brain. Dr Bhattacharya develops and uses cutting-edge theoretical and computer-assisted molecular modelling that mimics the shapeshifting behaviour of these neurotoxic proteins as it happens in the brain. He plans to learn more from the normal assembly of key proteins and derive design rules to develop drugs to reroute spontaneous and toxic protein assembly in Alzheimer's, Parkinson's disease and dementia to a controlled assembly with the overall impact of reversing the disease process.

A senior postdoctoral researcher at SSPC, SFI Research Centre for Pharmaceuticals and Department of Physics, Dr Bhattacharya works in collaboration with experimental partners across Europe. He holds a bachelor's degree in pharmaceutical sciences and a MSc in pharmacoinformatics from the National Institute of Pharmaceutical Education and Research in India and a doctorate degree in computational chemistry from UL.

Research into Epstein-Barr Virus associated cancers could prove key to personalised patient care

A study by UL PhD student Mahdi Nohtani provides new insights into Epstein-Barr Virus (EBV) associated cancers, specifically classic Hodgkin Lymphoma (cHL) and Diffuse Large B Cell Lymphoma (DLBCL) non-Hodgkin Lymphoma. The current therapy for cHL involves radiotherapy and severe chemotherapy, which can cause side effects such as infertility and secondary cancers.

Mahdi's research shows that children with cHL who also test positive for EBV respond better to therapy. This finding has potential clinical applications, such as using EBV status as a biomarker for patient stratification and personalised therapeutic approaches. Additionally, elderly EBV positive patients with cHL have a poor prognosis, which suggests that the potential use of EBV vaccinations or inhibitors as part of their therapeutic regimens could be helpful. The implications of this research extend beyond cancer as many of the exact mechanisms that drive cancer growth and progression are also involved in other diseases.

Mahdi is a final-year PhD student under the supervision of Professor Paul Murray, School of Medicine, Health Research Institute and Bernal Institute.

Understanding the structure and function of membrane proteins in energy conservation

Today's drug discovery is mostly about challenging targets, supramolecular structures or membrane proteins. The elucidation of the atomic model of any

protein or protein complex is key to understanding its detailed mode of action and facilitates the structure-based drug discovery process.

Professor Tewfik Soulimane's research activities focus on understanding the structure and function of selected membrane proteins, particularly those involved in cell respiration and energy conservation elucidating the atomic models of the oxygen-reducing enzymes ba3- and caa3-cytochrome c oxidases from the extreme thermophilic bacteria Thermus thermophilus.

Professor Soulimane contributed to knowledge of membrane protein production and crystallisation, such as GPCRs, LGICs and secondary transporters. Hence, his studies of eukaryotic and prokaryotic membrane proteins provided major contributions to the field of bioenergetics, signalling and ion transport. Currently, his research group encapsulates a broad range of multidisciplinary activities and collaboration-contributing expertise in the areas of biochemistry, molecular biology, microbiology and cell biology. Professor Soulimane directed the Industrial Biochemistry course at UL for a decade and established the Biomaterials Cluster at the Bernal Institute in 2017. Under his leadership, an agreement with the Algerian government was initiated in 2020 to bring hundreds of PhD students from his home country to study at UL. The first two cohorts of 140 Algerian students have progressed to their second year of the programme.

Professor Soulimane is Chair of Molecular Structural Biology at UL, Head of the Department of Chemical Sciences, Head of the School of Natural Sciences and managing director of the MOSAIC research group.

New material developed at UL can capture toxic pollutants from air

Researchers at UL developed a new material that has the ability to capture toxic chemicals from the air. According to the researchers, the material is capable of capturing trace amounts of benzene, a toxic pollutant, from the air and, crucially, uses less energy than existing materials to do so. The researchers believe that the sponge-like porous material could revolutionise the search for clean air and have a significant impact in the battle against climate change.

Professor Michael Zaworotko, Bernal Chair of Crystal Engineering and SFI Research Professor at the Bernal Institute, and colleagues developed the new material, and the findings of their work was reported in the prestigious *Nature Materials* journal.

Volatile organic compounds, including benzene, are a class of toxic pollutants that cause severe environmental and health issues. Developing technologies to remove benzene from air at trace concentrations and doing it with a low energy footprint are both challenges that have not been overcome until now. "A family of porous materials – like sponge – have been developed to capture benzene vapour from polluted air and produce a clean air stream for a long working time", explained Professor Zaworotko. "These materials could be regenerated easily under mild heating, making them candidates for air purification and environmental remediation. Our materials can do much better in both sensitivity and working time than traditional materials."

Along with colleagues from leading universities in China, Professor Zaworotko and Dr Xiang-Jing Kong of the Department of Chemical Sciences developed the new porous material, which has such strong affinity for benzene that it captures the toxic chemical even when present at just one part in 100,000. According to the researchers, the material resembles Swiss cheese because it is full of holes, and it is these holes that attract the benzene molecules.

In terms of energy, because the capture process is based on physical rather than chemical bonding, the energy footprint of capture and release is much lower than previous generations of materials. "Breaking up gas mixtures is hard to do. This is especially true for the minor components that comprise air, which include carbon dioxide and water. The properties of our new material show that breaking up is no longer hard to do for benzene", explained Professor Zaworotko.

As a result of this research, Professor Zaworotko features on a list that highlights the world's most influential researchers. Along with Professor Daniel Granato Professor in Food Science and Health at the Department of Biological Sciences, Health Research Institute and Bernal Institute, Professor Zaworotko was named once again on the Clarivate Highly Cited Researchers list, which highlights the top one percent of the world's researchers by citations. The 2022 list

features 6,938 researchers who have demonstrated significant influence in their field. It includes academics from 69 countries and regions around the globe – including 35 researchers based in Ireland. Professor Zaworotko was listed as a highly cited researcher in multiple fields and has been a highly cited researcher since 2014 in the field of chemistry. In 2018, he was named in the field of pharmacology and toxicology.

MY-Psy: UL researchers tackle youth mental health with innovative psychology programme

Researchers at UL are seeking to tackle youth mental health through a ground-breaking, psychology education programme. Research indicates that youth mental health is the leading health issue among young people worldwide and that mental health has worsened because of the COVID-19 pandemic. As such, there is an urgent need to develop supports and resources that can inform youth as to how best to protect their mental health and well-being.

MY-Psychology, or 'MY-Psy', is a ground-breaking psychology education programme that focuses on positive mental health and well-being promotion. The SFI-funded MY-Psy is led by Dr Jennifer McMahon, senior lecturer in Psychology at UL and Director of SCY-Lab (School, Child & Youth Mental Health, and Well-Being Lab). It is a collaborative partnership between the SCY-Lab, the Junior Health Sciences Academy (UL Hospitals Group, Mid-West Community Healthcare and UL) and the Limerick and Clare Education and Training Board and brings together research, education and healthcare specialities. Other key stakeholders include Jigsaw Limerick, the Limerick Youth Service and teaching staff in the Limerick and Clare area. MY-Psy was officially launched on Wednesday 16 November in UL, during Science Week 2022.

Speaking at the launch event, Dr McMahon said, "We believe that MY-Psy connects cutting-edge science with youth and teacher needs. Young people who complete the programme will understand the science of mental health and well-being and be able to translate that knowledge into the real world. MY-Psy links to the national well-being curriculum and can be an essential part of supporting students to successfully navigate the wonderful but sometimes difficult period of adolescence."

MY-Psy was created with youth stakeholders, who informed the design of the 12-session programme for Transition Year students. The programme focuses on the science of managing social media, understanding emotions and building relationships. It also includes sessions on changing health behaviours and how to engage in research.

Speaking on behalf of the young people involved in the programme, David Sheahan, a Transition Year student at Castletroy College and member of the MY-Psy Youth Advisory Panel, said, "This type of programme can capture young people's interest in learning more about science by getting involved in research that takes the time to listen to and take on our ideas."
Students will consolidate their programme engagement by completing a peer-led well-being promotion project in their school, with the award of a Certificate in Leadership in Mental Health and Well-being Promotion from the Junior Health Sciences Academy, UL.

Speaking about the programme, Dr Ruth Freeman, Director of Science for Society at SFI, said, "MY-Psy aligns very well to Science Foundation Ireland's strategic goals of promoting science for everyone, with its emphasis on active engagement and co-creation; and developing science for society, tackling the major societal challenge of mental health and well-being in youth."

MY-Psy is currently being rolled out in five schools in the mid-west, and it is hoped that the programme will be scaled up and delivered to a broader number of schools in 2023.

New resource pack on music, arts and migrant health

To mark International Human Rights Day on 10 December 2022, PART-IM (Participatory and Arts-Based Methods Involving Migrants in Health Research) launched a new resource pack entitled 'Music, Arts and Migrant Health Research' for musicians, academics and community practitioners looking for resources to help them integrate music and the arts into their work with migrant communities.

The resource pack was collated by Dr Fran Garry, postdoctoral researcher for PART-IM, and Professor Helen Phelan, Director of the Irish World Academy of

R&M Seminar December 2022 Planning Team

Music and Dance, in collaboration with PART-IM and Doras. It was launched by Kristina Mauer-Stender from the WHO Regional Office for Europe as part of a day-long arts-based seminar on refugee and migrant health research. This was the first seminar in Ireland to focus on making Ireland's health system more inclusive for people from different cultural backgrounds. According to Ahmed Hassan, Doras Community Sponsorship Support Worker and PART-IM Community Partner Representative, the evidence produced by the researchers in UL "will allow Doras to prioritise our work and help identify the needs of the people we serve."

PART-IM is an interdisciplinary research cluster led by Professor Phelan. The goal of the cluster is to bring together arts and health researchers with community partners to develop a better understanding of and greater expertise in the use of arts-based methods in migrant health research.

Understanding co-crystals and their ability to modify the physical properties of pharmaceuticals

Dr Maryam Karimijafari, postdoctoral research fellow at the Pharmaceutical Manufacturing Technology Centre and Department of Chemical Sciences, has joined the worldwide quest to develop better medicines.

More than 40% of newly discovered drugs are classified as low solubility, high permeability pharmaceutical ingredients (APIs). In essence, there is a need to improve the therapeutic performance of many new drugs. Various technologies have been developed to improve the physicochemical properties and solubility of these APIs.

Dr Karimijafari's work has focused on understanding co-crystals and their ability to modify the physical properties of pharmaceuticals. In 2021, she used process analytical technologies (PAT) as an inline measurement for monitoring co-crystallisation. Funded by the National Science Foundation (NSF) and SFI, the study led to the development of a hot melt extrusion process as a continuous manufacturing approach to achieving better drug formulations.

Project to develop a model of the human testes receives European funding of €1.5m

Dr Eoghan Cunnane, senior research fellow at UL's School of Engineering, was awarded a highly prestigious European Research Council (ERC) grant. Entitled 'RE3MODEL – Representative, Reliable and Reproducible in Vitro Models of the Human Testes', Dr Cunnane's project will address issues of male infertility.

Worth €1.5m each, the aim of the ERC starting grants is to help ambitious young researchers to launch their own projects, form teams and pursue their best ideas. The ERC is to invest €619m under the Horizon Europe programme to 397 researchers after receiving over 4,000 proposals.

Dr Cunnane was "thrilled to receive this award and to begin establishing my own independent research group." He explained that "Recent research has identified that the number of sperm cells present in male ejaculate has dropped considerably over the last 40 years and is projected to reach zero by 2045. Such an event would render the human species unable to reproduce due to male infertility." He added that "Despite this approaching crisis, clinicians have no effective treatment for male infertility and no means to test new treatments beyond animal models that poorly represent humans. This project will develop a truly representative model of the human testes that can act as a platform for identifying effective treatments in a reliable and reproducible manner."

Speaking about the ERC grants, Mariya Gabriel, European Commissioner for Innovation, Research, Culture, Education and Youth, said, "I am looking forward to seeing what new breakthroughs and opportunities the new ERC laureates will bring, and how they will inspire young people to follow their curiosity and make discoveries for the benefit of us all."

As well as being a researcher at the Bernal Institute, Dr Cunnane is a co-founder of the start-up company Class Medical, which was spun out of UL to commercialise a patented urinary catheter safety device that is currently being supplied to hospitals across Ireland. He recently joined the School of Engineering as a Senior Research Fellow.

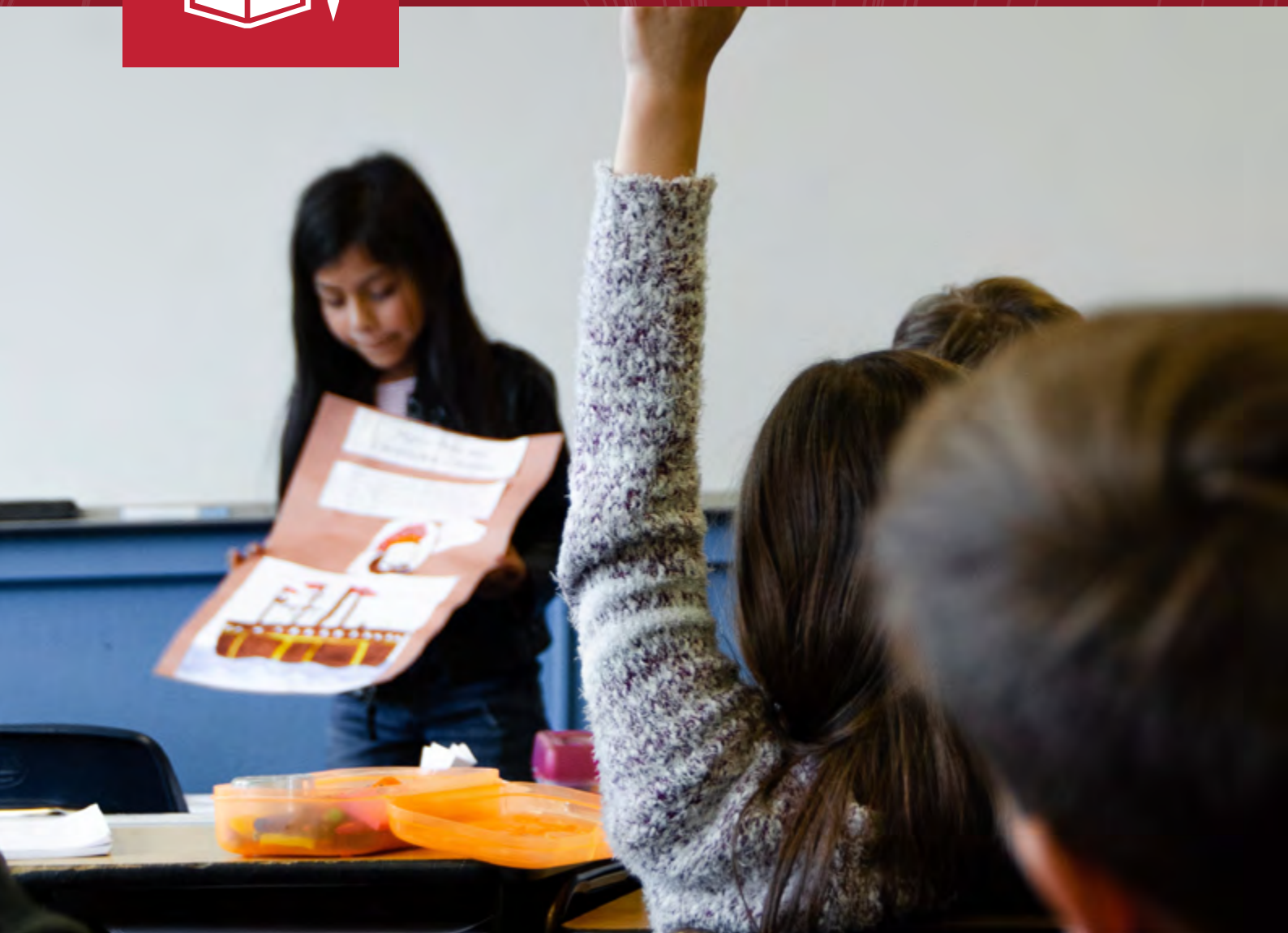
Giving Voice

"Achieving sustainability is about how we, as a collective, change our mindset towards small, everyday tasks rather than trying on our own to tackle one immense challenge after another and seemingly getting nowhere. These marginal gains are achievable and realistic, and once accumulated, will be the difference in creating a greener future. Sustainability means a healthier planet for our children, our grandchildren. As a Global University, we need to recognise and challenge our own carbon footprint while also recognising the need to embrace an international education that is vital to help shape future leaders who will decide the outcome of this great challenge."

Charles Cunningham, Study Abroad Executive Administrator, UL Global

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

4 QUALITY EDUCATION



Outdoor Science Education for a Sustainable Future (OTTER)

OTTER is an EU H2020-funded project that aims to help people better understand Education Outside the Classroom (EOC) approaches and how such approaches can help improve the acquisition of scientific knowledge and transferable skills in students, specifically in the field of environmental sustainability and the reduction of plastic waste. The project aims to increase interest in scientific topics among young people while also contributing to the range of innovative educational projects and the increase of scientific citizenship within the EU. EOC sites are out-of-school settings, such as outdoor activities, fieldtrips, community and botanical gardens, museums, zoos, scientific centres, community settings, the internet, enhanced digital learning and media, that keep students healthy, both physically and mentally. Our approach adapts student-centred and inquiry teaching methods to create positive and engaging learning experiences for students.

OTTER aims to strengthen educational EOC networks within Europe by connecting experts from four different regions (Finland, Hungary, Ireland and Spain). The strengthening of these networks will be utilised to carry out a programme of EOC pilot schemes and an analysis of the effect they have on the performance of participating students, including their levels of sophisticated consumption and scientific citizenship, and to deepen an understanding of the effects of education outside the classroom on EU citizens. The pilot schemes will share a common theme revolving around issues of plastic waste and recycling to build upon recent momentum in tackling related global educational, social and environmental issues. Each partner works with local primary and second-level schools, industry and the community.

Colleagues from the School of Education – Dr Orla McCormack (PI), Dr Regina Kelly (PI) and Dr Deirdre O'Neill (postdoctoral research) – are responsible for leading the Irish pilot and evaluating and monitoring the project. The pilot schools are working to connect student learning to six of the sustainable goals in particular: Clean Water and Sanitation (SDG 6), Sustainable Cities and Communities (SDG 11), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13), Life Below Water (SDG 14) and Life on Land (SDG 15). However, to date, the scope of the planned learning experiences also addresses issues of Quality Education (SDG 4), Gender Equality (SDG 5), Affordable and Clean Energy (SDG 7) and Industry, Innovation and Infrastructure (SDG 9).

"The OTTER Labs aim to promote three key pillars: Sustainable Development, 21st Century Skills and Inclusion & Diversity", explained coordinator Dr O'Neill. "Our teachers have championed the alignment of OTTER Lab learning objectives with their respective curricula across age groups and subjects to provide a holistic learning experience for their students. It is inspiring to see these teachers express their passion for creating engaging learning experiences for their students, planning for rich exposure to real life sustainable issues in their locality and outside the classroom."

Open access to CALS webinars and recordings

This initiative aims to increase inclusive and equitable access to quality education and lifelong learning for all. With permission, events hosted by the Centre for Applied Language Studies (CALS) are now recorded and made available on an open-access basis through the CALS website.

The substantial and growing number of webinars and online events organised by CALS means that individuals from all over the world can access these educational artefacts. This can happen either in real time or through the events repository on the website after the event. Even through Twitter activity and the range of destinations from which participants arrive online, there is some evidence that the impact of these initiatives is widespread.

The events are organised and recorded by CALS Director Professor Fiona Farr, Associate Director Dr Elaine Riordan and other CALS members.

UL appoints energy entrepreneur as Adjunct Professor of Smart Energy Systems

UL appointed energy entrepreneur Dr Paddy Finn as Adjunct Professor of Smart Energy Systems in January 2022. Dr Finn, who is CEO of Castletroy-based energy tech company VIOTAS, joined UL's Department of Electronic and Computer Engineering in December 2021. This completed a loop for Dr Finn, who previously spent 12 years at UL, where he attained his undergraduate and doctorate degrees and undertook two postdoctoral research fellowships.

"Looking back on the time I spent at University of Limerick, from undergraduate through to postdoctoral

research fellow, I most fondly remember the teaching opportunities that allowed me share my own learnings, perspectives and approach to problem solving with others", said Dr Finn, who founded Limerick smart grid business VIOTAS in 2013 with business partner Duncan O'Toole. "I am now truly humbled and honoured by my appointment as adjunct professor of Smart Energy Systems at my *alma mater*. I look forward to supporting the department in the enhancement of content relating to smart power systems so a greater number of graduates can enjoy rewarding careers where they apply their skills and knowledge to solving the technical challenges associated with decarbonisation globally", he added.

VIOTAS aims to democratise electricity markets and enable a more sustainable future by developing demand response technologies and services. These allow commercial and industrial electricity customers to get paid for automatically adjusting their electricity consumption to support the reliability, security and stability of national electricity grids.

The company's services are used extensively by EirGrid and are credited with playing a key role in curbing the effects of the widely publicised power generation shortages this winter. VIOTAS employs more than 80 staff in multiple countries around the world, including Australia and Poland.

Dr Finn said he developed an interest in demand response and smart grid solutions during his time at UL, which he credits to Professor Colin Fitzpatrick, now Head of the Department of Electronic and Computer Engineering at UL. Professor Fitzpatrick said, "We are thrilled that Paddy will be joining us as an adjunct professor. Our students will benefit enormously from working with a tech entrepreneur at the cutting edge of smart grid systems who is taking technology that was developed here in Limerick and rolling it out across the world. As Ireland and countries across the globe strive to reach ambitious decarbonisation goals over the coming decade, it is essential that our engineering students are exposed to the ideas, technologies and business models which are needed to get us on this sustainable pathway, and this is one of many ways that we are embedding the UN sustainable development goals across the curriculum here at UL."

UL and Skillnet launch Ireland's first micro-credential programmes for climate action

UL partnered with Skillnet Ireland to launch the first enterprise-led micro-credential programmes dedicated to climate action in Ireland. Micro-credentials are small, accredited courses designed to meet the demands of learners, enterprise and organisations.

Developed by Skillnet Ireland's Climate Ready Academy, micro-credentials will enable participants to develop tailored sustainability charters and action plans for their organisations across the areas of energy, sustainability, waste and circularity while also achieving recognised third-level certification on the National Framework of Qualifications. Micro-credentials may be stacked, over time, leading to a full Level 7 award accredited by UL.

UL played a critical role in the delivery of the MicroCreds national project, which was led by the Irish Universities Association (IUA) and implemented in partnership with each of the seven founding IUA universities. The project's vision is to empower lifelong learning in Ireland by re-imagining learners' relationships with education through agile, accessible and bite-sized qualifications, i.e., micro-credentials.

Skillnet and UL launched the 'Energy Leaders', 'Waste and Circular Economy Leaders' and 'Sustainability Leaders' programmes, which are designed to incentivise and support employees in developing practical environmental improvements for their businesses. Discussing the programmes at the launch in October 2022, Skillnet Ireland Chief Executive Paul Healy said, "The climate action leadership programmes launched today play a pivotal role in developing the talent needed by industry and in meeting the targets of the government's climate action plan. These new micro-credentials offer participants the opportunity to achieve a level 7 certificate. This expertise will be used by leaders in practical ways to make their businesses more sustainable and climate ready. We look forward to working with industry and academic institutions as we develop more programmes through our Climate Ready Academy."

Earlier in 2022, Skillnet Ireland published research entitled 'Talent for Ireland's Green Economy' in partnership with the Economic and Social Research Institute (ESRI). The report found specific skills gaps that are holding businesses back when it comes to developing and implementing sustainability strategies.

The new programmes are one of Skillnet Ireland's new initiatives designed for removing these identified barriers.

DSAI Summer School

The Development Studies Association Ireland (DSAI) Summer School 'Researching Sustainable Development: Tools for Developing a Critical Perspective' was held over two days, 31 May and 1 June 2022, at the Technological University of the Shannon (TUS) Thurles campus in Co. Tipperary. Funded by Irish Aid, the project brought students, policymakers, development practitioners and academics together on a common platform to engage with the SDGs using critical perspectives. The aim of the Summer School was to develop research skills through exposure to researchers, policymakers and practitioners working within the theme of sustainable development.

According to Dr Nita Misra of UL and chairperson of DSAI, "This was a cutting-edge event because it brought into light new research on SDG themes as well as equipping participants in problem-based learning tools." Enabling participants to take a deep dive into the topic, the event featured a wide range of expert contributors to keynote presentations and breakout panel discussions. The sessions unpacked aspects of sustainable development including well-being, children's rights, conflict, gender, water and heath, and migrant and refugee rights in Ireland. Contributors came from across research, policy and practice, including from Plan International, Safer World, University of Stirling, Atlantic Technological University and TUS.

Development Studies Association Ireland Summer School

With the assistance of an experienced facilitator, each breakout focus group explored a core problem related to the SDGs. Groups were encouraged to move out of their normal, sectoral silos and challenged to incorporate new and unexplored SDGs into their own research.

Widening access and opportunities for PhD supervisors

UL's capacity to supervise PhD candidates is a significant factor in contributing to the achievement of its goals, such as developing an academic reputation and international visibility that helps to attract and retain talent in the region and recruit students from across the world.

There is anecdotal evidence that it is not the number of PhD candidates in the system that limits opportunities for academics to gain experience in PhD supervision but rather the fact that less experienced colleagues are not being afforded the opportunity to join supervisory teams. To explore this, a study initiated within the Faculty of Education and Health Sciences and now residing within the Doctoral College gathered evidence on the number of PhD candidates that individual academics are supervising, the level of appointment of supervisors, the number of supervisors allocated to PhD candidates, the number of academics not supervising and possible reasons for this, the academics' ambitions in terms of supervision, and the challenges and needs of academics new to UL as they consider supervising opportunities.

Providing forums in which colleagues can learn more about PhD supervising opportunities is important. As one study participant commented, "It's good to hear how other people approach supervising because you don't get to work with very many people in this capacity. It's good to hear different kinds of approaches and stories."

Maximising the PhD supervision capacity to grow quality flagship PhD programmes that showcase areas of strength and enhance our international reputation relates to SDG 4, Quality Education, while widening access to academics who have not had opportunities to supervise PhD candidates relates to SDG 10, Reduced Inequalities.

Teaching social justice in physical education initial teacher education

Physical education (PE) teacher educators and pre-service teachers (PSTs) on the professional master's in education (Physical Education) from the Department of Physical Education and Sport Sciences have linked up with colleagues from the School of Education at Ulster University to explore teaching social justice in a physical education context. As the physical education community pleads for more social justice work to be done in PE, we explore 'how' we can teach about, through and for social justice. The collaborative nature of this research project between teacher educators and PSTs will foster shared learning that can be used to inform policy and practices across the teacher education continuum, including teacher education programmes, teaching and learning in schools and professional development.

In April 2022, the project team was awarded €25,000 from the Standing Conference on Teacher Education, North and South (SCoTENS) research initiative: Teaching and Learning to explore 'How we teach: acknowledging, understanding and learning with others and from others on a shared island'. Running until September 2023, the project supports collaboration and dialogue among staff and students in the two teacher education programmes in Northern Ireland and the Republic of Ireland.

Exploring contemporary issues of relevance to education in both jurisdictions, we are providing the opportunity to enhance our understanding of the community and context of others. Among the proposed outcomes of the project are the development of social justice teaching resources and the construction of evidence-based best practices of socially just approaches. These can inform the programme offered by professional development services, thereby sustaining a community of learners interested in social justice across the Island of Ireland.

The project supports practitioner research that will enable teacher educators and PSTs to reflect upon and develop their pedagogical approach and curriculum delivery for matters relating to social justice. The project offers enormous potential for a sustained approach to 'learning with' and 'learning from' each other. An exciting element of the project is the use of learning from teaching online during the COVID-19 pandemic to facilitate PSTs at UL and Ulster University to engage together in shared tutorials and focus groups.

For one project team teacher educator, the case studies have made them "reflect on my position and that I have a lot to learn around social justice. My awareness of what is considered appropriate in terms of language relating to gender has certainly been heightened, and I must say, I am enjoying the learning thus far."

TELME European Mundus Application

The Teaching Foreign Languages in a Multicultural Environment (TELME) consortium was awarded European Mundus Design Measure funding of €55,000 in November 2021. Design work was ongoing from the end of 2021 and through 2022. The aim of the proposed European Mundus MA programme is to educate high-quality professionals to teach foreign languages in a multicultural environment. The master's will be a two-year programme with students spending the two years in different institutions (gaining 120 credits overall – 60 per year).

The TELME consortium is united in the common belief that higher education and continuing education have a critical role to play in the global quest to address the societal challenges that underpin the SDGs through innovations in teaching, learning, scholarship, operations and community leadership. TELME will place these goals within the Universal Design for Learning (UDL) framework, which implies providing individualised learning support and offering students the opportunity for co-construction. This also means building on the connections with our research laboratories and giving students opportunities to attend research workshops and conferences.

The programme team in UL comprises Dr Elaine Riordan, Professor Fiona Farr, Professor Helen Kelly-Holmes and Ivanna Darcy (UL Global).

Piloting the K4C-4-Kids Junior Researcher Training Programme

Delivered in spring 2022, the 10-week K4C-4-Kids Junior Researcher Training Programme included an on-campus lab-based workshop to help the participating pupils define their research question and plan their methods. The programme was co-designed and delivered by staff from UL Engage, the SFI Research Centre for Pharmaceuticals (SSPC) and Gaelscoil Sheoirse Clancy. The Gaelscoil is a small Irish-language school on the south side of Limerick

city. The lessons and workshops were delivered in English but included some Irish language terminology. The pupils worked in small groups on projects that considered a variety of research questions.

The aims of the programme were to introduce the children to the UL Knowledge for Change (K4C) hub and UNESCO K4C activities worldwide, the concept of research, knowledge creation and how knowledge can be used to effect change. The programme supported the children to design and carry out independent research; it allowed them to take an active role in the research process and helped them to see higher education as a future option. Gaelscoil Sheoirse Clancy is a DEIS school in an area of socio-economic disadvantage where residents are typically under-represented in higher education.

The programme culminated in a poster presentation day during which the pupils confidently explained their processes and findings. A full review of the programme is currently being undertaken with a view to offering it to additional schools. Feedback from the school staff was very positive; teachers noted an increase in the pupils' leadership and independent learning skills and a positive change in the way they spoke about university. One teacher described how their students were able to "imagine themselves going to college. I heard them discussing it and I don't think it would have come up before. I think it opened their eyes to different opportunities."

BD and UL collaborate as students receive bursaries

Padraig FitzGerald is the R&D Director and Site Leader at one of Ireland's leading med-tech research facilities, BD Research Centre Ireland (BC RCI) at the National Technology Park. According to Mr FitzGerald, the growing demand for STEM-based (science, technology, engineering and mathematics) skills in Ireland can be met only through enhancing the public-private approach.

Mr Fitzgerald made his comments as BD RCI presented awards to 10 UL students under its leading scholarship and bursary programme in April 2022. The programme is funded by the company through the UL Foundation to support students from UL's Access programme, which works to encourage the participation of students from groups that have been under-represented in the third-level sector.

Through the BD RCI awards, four female students studying science and engineering received BD Bursaries for Women in STEM and six students received the BD Scholarships in Science and Engineering based on their outstanding academic achievement. A key element of the BD RCI programme is that recipients of the bursaries and scholarships will be assigned a professional mentor from BD.

Commenting at the event, Mr Fitzgerald said, "From government to industry and education, there is consensus that we have a challenge in terms of STEM skills. A European Commission report suggests that 24 out of every 1,000 female graduates have an ICT-related subject and only six go on to work in the digital economy. Growing the number of women engaged with technology is hugely important for the sector as it will bring vital new perspectives as well. It is a challenge I am very confident we can meet but it will take collaboration from industry, education partners across third and second level and, indeed, government support. The task is for industry, education and government to continue working on this, not least in the area of ensuring access for all to third level."

According to Mr Fitzgerald, "Ultimately, Limerick and Ireland have a huge opportunity here. We are clearly a favourable location for inward and indigenous investment, we've got an excellent reputation in the space, have got superb collaboration going on between third level and industry, as this programme and other initiatives at UL reflects."

Sarah Hartnett, Director of Development at the UL Foundation, said, "It is fantastic to see pioneering companies like BD RCI demonstrate such leadership with their support for the programme to deepen STEM skills, and we are delighted to have the opportunity at UL to partner with them. We are particularly pleased that this engagement focuses specifically on not just women in STEM but under-represented student groups at third level."

UL Glucksman Library supports Open Science & the UN SDGs

Ensuring that publicly funded scientific research is freely available to the public is the challenge that the Open Science movement faces. Traditionally, scientific outputs have several barriers that impede broad dissemination of scientific data. Most research publications are published in scientific journals that require paid subscriptions to access. Research data is often poorly formatted and described, and the use of proprietary software makes it difficult to re-purpose. This slows the research process and acts as a barrier to citizens and other researchers attempting to engage with scientific literature and projects. Open Science has the potential of making the scientific process more transparent, inclusive and democratic. It is increasingly recognised as a critical accelerator for the achievement of the UN SDGs and a true game changer in bridging the science, technology and innovation gaps and fulfilling the human right to science. Acknowledging the importance of Open Science to the realisation of the SDGs, UNESCO published its recommendations for Open Science in 2021.

Through the Glucksman Library, UL is heavily involved in Ireland's transition to an open research environment. Several developments occurred in 2022 that helped to further Open Science and enabled UL's published output to be made publicly and freely available to a global audience.

The library's senior leadership team provided national leadership and worked closely with international leaders to influence national strategy in a significant way. Library staff members co-chaired three National Open Research Forum (NORF) working groups and subsequently co-authored policy briefs on several topics. These briefs were the foundations of Ireland's *National Action Plan for Open Research 2022-2030*, which was launched in 2022. The action plan serves as a roadmap for the implementation of open research across Ireland and is structured according to three broad themes: establishing a culture of open research, achieving 100% open access to research publications, and enabling FAIR (Findable, Accessible, Interoperable, Reusable) research data and other outputs.

In addition to the work of NORF, the Glucksman Library signed over 20 open-access publisher agreements as part of the IReL consortium. In 2022, with the help of the Glucksman Library, 335 articles published by UL researchers were made freely accessible using these agreements. This accounts for approximately 60% of all articles published by UL corresponding authors.

Further developments in 2022 in Open Science included the launch of a FAIR data training series and data management plan consultation service provided by the Glucksman Library. A newly updated research repository was launched, which includes freely accessible versions of UL's research outputs. In addition to storing journal articles, the new repository has the functionality to support open datasets and other different media types and to provide separate, custom-branded spaces for books, conference contributions, journal contributions and more. The collaborators are the Library & Information Services Division, NORF and the IReL Irish Research eLibrary.

Minister for Further and Higher Education, Research, Innovation and Science Simon Harris announced funding of €1.7m through the Higher Education Authority (HEA) to support the uptake and implementation of open research practices in Irish higher education institutions and the wider Irish research system.

Limerick Irish Algerian Friendship project

The Limerick Irish Algerian Friendship (LIAF) project was founded after 134 Algerian PhD students arrived at UL in January 2021 – right in the middle of a COVID-19 lockdown. LIAF was created as an answer to the question "How can we support this academic community?" An idea was born to take a holistic approach and follow best practice in relation to PhD education and internationalisation. International student integration is not only a university issue but a community one.

The aims of LIAF are to provide a second home for Algerian PhD students at UL, to strengthen relations between the two countries and to support the multicultural drive and internationalisation developments of Limerick city and county. LIAF is run by a steering group comprising members from UL, including the International Structured PhD course director Dr Angela Farrell, intercultural advocate Michelle Daly, supervisors and members of Limerick City & County Council and an executive group of four Algerian PhD students.

LIAF continued its work throughout 2022 with numerous events, including contributions to Culture Night, Africa Day, St Patrick's Day, coffee mornings and a lecture series. In October 2022, the foundation for an Algerian oak forest on the grounds of UL was laid at a tree-planting ceremony. The event was presided over by UL President Kerstin Mey, Mayor of Limerick Francis Foley and Algerian ambassador to Ireland His Excellency Mr Mohammed Belaoura.

Access and equity

Broken into five strands, PATH (Programme for Access to Higher Education) is a dedicated fund committed to increasing participation by under-represented groups in higher education. KBS faculty undertook an evidence-based evaluation of the progress of PATH 3 across the three higher education (HE) institutions in the Mid-West of Ireland (UL, MIC and TUS) to explore the effect of the HE- and community-based pre-entry and post-entry initiatives on access to, progression during and completion of third-level education. The report evidences the lived experiences of those who feel excluded from education or struggle to access, transition to and progress through HE. The report makes reference to the important impact of the PATH 3 Mid-West Cluster's programmes on those under-represented groups and their journey through education and highlights the incredible resilience of the learners, and their families, in achieving their educational aspirations. The report also reveals the unbreakable community spirit and support offered by the education and community stakeholders as well as the staff of the PATH 3 projects and wider access programmes in UL, MIC and TUS.

Science and Engineering sustainability scholarship programme

In November 2022, UL's Faculty of Science and Engineering (S&E) launched its S+E sustainability scholarship programme. This new initiative will support collaborative, transformative and interdisciplinary research that addresses key areas of sustainable development and themes outlined in the UN SDGs. Applications were received from S&E and interfaculty disciplines. S&E is committed to taking a holistic approach to sustainable development, and the expertise of scientists, engineers, computer scientists, mathematicians and designers is required to develop impactful and transformative solutions while protecting our natural environment. Including annual registration fees and an annual stipend, each scholarship will support a PhD scholar over a four-year period.

Below are some of the project themes:

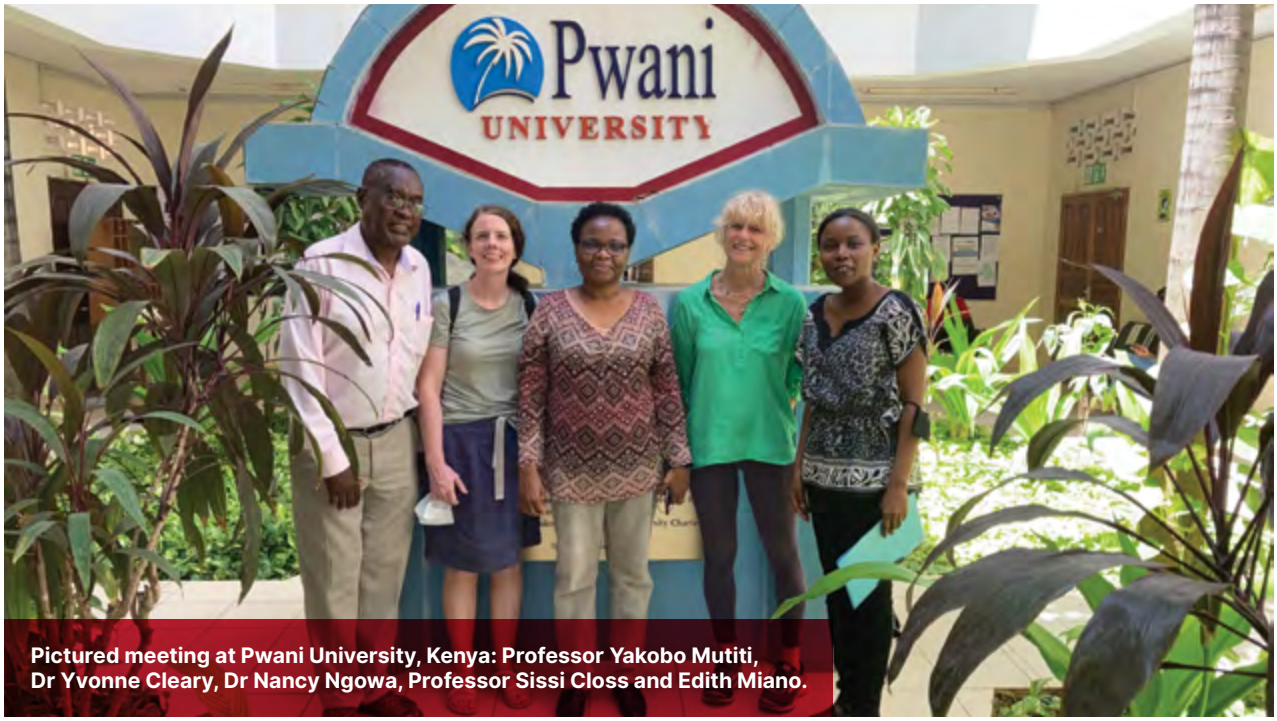
- Giving voice to nature: Digitally enabled human-nature interaction to support restoration practices in the Shannon river
- Virtual reality: Fostering inclusive and sustainable industry 4.0
- Elucidating structure/property relationships in sustainable lignin-derived carbon for application in future Na-ion batteries (NIBs)
- Sustainable antioxidant and anti-neuroinflammatory bioactive compounds from Irish industrial by-products: From cell systems to innovative functional foods
- Improving the ability of the off-site construction industry in Ireland to address the country's social housing crisis
- PotatoBIO
- Co-designing the future of menstrual products
- ReSolar: Novel approach to critical raw material recovery from waste PV panels
- Prediction of the plastic yielding of additively manufactured steel 316L: Development and validation of a physics-informed mathematical model
- Unbuilding: Re-thinking the construction of the coastal edge in the face of climate change

Developing technical communication education in Kenya

Dr Yvonne Cleary, Head of the School of English, Irish, and Communication, participated in two related projects to develop technical communication education in Kenya. Currently, no technical communication academic programmes are offered in Africa. The projects are led by Professor Sissi Closs from the University of Applied Sciences in Karlsruhe. The VIEL project is funded by the Baden-Württemberg Stiftung in Germany. Since October 2021, students on the MA in Technical Communication and E-Learning at UL have participated in a virtual exchange project with students from Karlsruhe University of Applied Sciences (Germany) and Pwani University (Kenya).

Students from the three institutions have virtual meetings and regular online workshops. Speaking about the exchange, Dr Cleary explained its benefits for students: "So many of our students want to learn about different cultures, broaden their horizons, make international contacts, and get to know the international field of technical communication.

This project promotes all those goals in a virtual, but deeply engaged, way." The second project, a Master's in Communication and Media (MCM), is funded by DAAD, the German Academic Exchange Service, and aims to develop a module, and eventually a full master's degree, in technical communication at Pwani University. Dr Cleary travelled to Kenya to meet project partners and work together on the development of the master's programme in February 2022. These collaborations follow on from Dr Cleary's participation in the TecCOMFrame Erasmus + project from 2015 to 2018. In that project, partners developed curricula and a competence framework for technical communication. They are now using the framework and prototype curricula to develop the proposed academic programme.



Pictured meeting at Pwani University, Kenya: Professor Yakobo Mutiti, Dr Yvonne Cleary, Dr Nancy Ngowa, Professor Sissi Closs and Edith Miano.

Giving Voice

"Educating for a sustainable future is core to influencing real change. 'Sustainability' has many different meanings to many different people. We understand this and work with students, pre-service and in-service teachers to celebrate good practices that encompass the SDGs and further challenge their beliefs to deepen their understanding of sustainability. We are all responsible for creating awareness and communicating the issues related to sustainability to reach audiences from all walks of life. We need to capture the perspectives of our communities and act on their concerns, to show that every voice matters and even small change can contribute to our shared vision of a sustainable future."

Dr Deirdre O'Neill, Postdoctoral Researcher, School of Education

Achieve gender equality and empower all women and girls.

5 GENDER EQUALITY

Working towards referendums on gender equality, care and the family

Several provisions in the Constitution are currently in need of reform. Following her work with the Citizens' Assembly, Dr Laura Cahillane worked closely in 2022 with the Oireachtas Committee on Gender Equality in making recommendations on potential referendums and on wording for the proposed changes. If the relevant articles in the Constitution are changed, it could be transformative for the lives of those affected – particularly on the issue of care and the definition of the family.

According to Dr Ivana Bacik TD, Cathaoirleach of the Oireachtas Committee on Gender Equality, Dr Cahillane provided invaluable support to the work of the Committee in "working on a report for the Committee which provided potential wording options for a replacement provision for Article 41.2, as well as various options for the amendment or replacement of aspects of other constitutional provisions also under consideration by the Committee: Articles 40.1 and 41." Dr Bacik added, "Dr Cahillane, who also worked with the Citizens' Assembly, has carried out in-depth research on Article 41.2 – the 'woman in the home' provision – and she appeared before the Committee in private session in order to present us with some of her research into this provision and to assist us in considering the various options available in terms of replacing or repealing this provision. Because of her unique research on this issue, she was able to provide a detailed analysis of the manner in which this provision has worked (or indeed not worked) in the past as well as giving us detailed insights into its potential implications for the future, depending on whether it would be retained, repealed or replaced."

Dr Cahillane is a senior lecturer in the School of Law and has advised the Oireachtas on law reform on several occasions. Her work has been cited several times in the Dáil and Seanad, by the Irish superior courts and in UK parliamentary briefings, and she is a frequent contributor to the media on legal and constitutional issues.

Supporting female judges from Afghanistan to return to education

In September 2022, UL Provost Professor Shane Kilcommins, together with Dr Sandra Joyce, Dean of the Faculty of Arts, Humanities and Social Sciences (AHSS); Dr Ger Coffey, course director of the LLM in Human Rights in Criminal Justice; and Dr Angela Farrell, Assistant Dean International AHSS, welcomed a group of six female judges from Afghanistan to the UL campus to mark their enrolment on the LLM programme. The judges were forced to flee Afghanistan when the Taliban took control of the country in 2021 and have since been resettled in Ireland.

Welcoming the group to the LLM programme, Dr Laura Cahillane, senior lecturer in the School of Law, commented, "This initiative took a lot of work, particularly from Justice Shireen Fisher and the International Association of Women Judges, to make it all happen. When Shireen contacted me initially last year, most of the judges were still in Afghanistan and we weren't even sure how they were getting out so to see them here now in UL beginning new courses is amazing."

Justice Fisher served as a trial judge on the War Crimes Chamber of the Internationalized Court of Bosnia and Herzegovina (2005-2008) and is currently a Justice on the Residual Special Court for Sierra Leone. Following her initial contact with Dr Cahillane, she worked closely with Dr Angela Farrell, Dr Ger Coffey and the ULLC teachers to assess the needs of the group, to develop appropriate supports to facilitate their entry to the LLM programme and to address their ongoing academic requirements. From this, a close and fruitful relationship developed between all those involved, as evidenced in the Justice's comments: "Working with Angela and with UL has been a joy. All the relevant people and departments of the university with whom I have interacted have demonstrated a commitment to providing a high-quality educational experience for the judges while retaining the flexibility necessary to meet the needs of this unique group of women. The institution's humanitarian ethos is truly inspirational."

The judges are being guided through their two-year programme of study by the LLM team at the School of Law. Led by course director Dr Ger Coffey, the team includes Professor Shane Kilcommins, Dr Alan Cusack, Dr Johnny Connolly, Professor Seán Redmond and

Eoin O'Meara-Daly. Dr Coffey commented: "I am really delighted to have met these brave and honourable judges from Afghanistan and look forward to working with them on the LLM in Human Rights in Criminal Justice."

UL hosts major Irish studies conference on 'intersectional Irelands'

In 2022, an Irish studies scholarship began to draw on critical race and anti-colonial theory, migration and diaspora studies, disability studies, feminist and queer theory, and class studies, among other critical perspectives, to broaden the critical discourse beyond the static literary-historical categories of the past and forge new understandings of Irish literary cultures. Traditional fixed points on the charts of Irish culture have become further unsettled as recent research raises challenging questions about Irish complicity in the Atlantic slave trade and exploitation of indigenous populations.

With this context in mind, the 2022 International Association for the Study of Irish Literatures conference, hosted at UL in July 2022, comprised diverse membership across the Faculty of AHSS in addition to other UL departments and divisions. The conference adopted the theme of 'Intersectional Irelands', drawing on Kimberle Crenshaw's formulation of 'intersectionality'. Coined in 1989, the term is used to define a framework that encourages scholars to conceptualise how larger systems of power, privilege and oppression intersect with social categories like race, class, gender and sexuality. Patricia Hill Collins has described intersectionality as part of a move to "build participatory, democratic interpretive communities across differences of experience, expertise, and resources." Recent efforts to decolonise the literary canon are a case in point, as scholars address historical imbalances in classroom and research practice. As Irish society becomes increasingly multicultural and multilingual, it is timely to address the construction and representation of intersectionality in our literary culture.

The conference attracted close to 200 scholars – postgraduates, early-career scholars and more established academics – as well as creative writers, activists, musicians and performers from Ireland, the UK, Europe, Australia, New Zealand, North America, South America, Africa and Asia. Delegates considered diverse topics such as 'Irish Traveller Writing', 'Writing While Trans: Refractions, Reflections, Representations', 'Multilingual Irish Studies', 'Class Action' and 'Performance Activism' in panel and roundtable discussions.

Shining a spotlight on the Irish studies expertise of UL faculty members, the conference brought attention to UL's Sustainability Framework 2030, speaking particularly to the institution's commitment to fostering an 'egalitarian university'. The conference created a space in which a diverse group of participants considered ways in which Irish literature and culture and their scholarship might build participatory, democratic interpretive communities across differences of experience, expertise and resources. It also sought directly to intervene on questions of socio-economic diversity, racial and ethnic diversity, equality of opportunity, gender diversity, accessibility, inequalities, exclusion and structural bias, as outlined in the Sustainability Framework.

By linking UL to city centre locations, including Ormston House, Dolan's, the Belltable Theatre and King John's Castle, the conference sought to further the institution's commitment to a 'cosmo-local' approach, as outlined in mission 2 (Economy: Cosmopolitan Localism) of the Sustainability Framework. As a testament to the conference's importance in creating local business and bringing international visitors to the region, conference team members were awarded a Fáilte Ireland Conference Ambassador Award in autumn 2022.

Johnson & Johnson WiSTEM2D programme launched for 2022/23 academic year at UL

In September 2022, ahead of the 2022/23 academic year, Johnson & Johnson launched its WiSTEM2D programme in partnership with Lero, the UL-based SFI Research Centre for Software.

WiSTEM2D stands for Women in Science, Technology, Engineering, Mathematics, Manufacturing and Design. The aim of the Johnson & Johnson WiSTEM2D undergraduate programme is to inspire and support more women to pursue a career in STEM (science, technology, engineering and mathematics) after university and increase female representation in the STEM2D workforce.

"At Johnson & Johnson, we are firm believers in working with our educational partners to create a talent pipeline for the future", said Anna Rafferty,

Johnson & Johnson WiSTEM2D University Lead and Director of Strategy, Johnson & Johnson Campus Ireland. "We recognise that we have a part to play in ensuring a fairer representation for women in STEM fields. This is why we have developed the WiSTEM2D programme, to build a diverse STEM community that reflects the great diverse aspects of society, by supporting and nurturing women studying in STEM".

STEM courses are growing in popularity. The Central Statistics Office reported that Ireland has a much higher level of STEM graduates when compared with other EU nations – 35% for Ireland compared to an EU average of 19%. However, there is still a disparity between the number of CAO applications from males and females, with fewer from females. According to the HEA, one in three students on STEM courses in third level identify as female.

The Johnson & Johnson WiSTEM2D programme fuels the development of the female STEM2D talent pipeline by awarding and sponsoring girls and women at critical points in their STEM educational experience and careers. First introduced at UL in 2016, the programme expanded to include University College Cork in 2018 and University of Galway in 2021 and has supported more than 300 female students since its inception. The programme included Munster Technological University (MTU) for the first time in 2022.

Jenna Bromell was a participant in the WiSTEM2D programme during its first year at UL in 2016. Now working as a process engineer at Johnson & Johnson Vision in Limerick, Jenna said, "The support, connections and inspiration that the WiSTEM2D programme provided during my time in college really empowered me to pursue a career in engineering. It gave me a real taste of what I could do as a woman in STEM and set strong foundations for me to build my career on."

According to Dr Katie Crowley, Funded Investigator in Lero and lecturer in the Department of Computer Science and Information Systems, "The Johnson & Johnson WiSTEM2D programme sponsors and supports female STEM2D students to excel in their careers and encourages them to be role models for their peers. UL, through Lero, is delighted to partner with Johnson & Johnson again on the programme and I am very excited to be a part of it this year. We are committed to fostering an open and inclusive STEM culture that mentors and nourishes female leaders of the future."

Female entrepreneurs

Three strands of research by KBS researchers sought to further our understanding of the experiences of women in business. As well as highlighting the barriers women face in terms of equality, the research also investigated the potential links between women and sustainable business. The research aligns with UN SDG 5, Gender Equality; SDG 8, Decent Work and Economic Growth; and SDG 9, Industry, Innovation and Infrastructure. The three strands are explored below.

Strand 1:

Gender of entrepreneur and quality of created jobs

Dr Claire Harnett's study on the relationship between an entrepreneur's gender and the quality of jobs they create found that female entrepreneurs were more likely to use more precarious forms of work arrangements for their employees, such as zero-hours contracts and less than full-time hours. While this indicates that using objective measures, female entrepreneurs offer more precarious work, it is important to consider varied factors such as the needs of the employees and the business context. When looking at employee needs, it emerged that employees do not always see part-time hours as precarious. Several entrepreneurs, particularly in the retail sector, reported that while they would prefer to have full-time employees, their employees requested a shorter working week.

Strand 2:

Female entrepreneurs and sustainability

An interdisciplinary group of KBS academics (Dr Antoinette Flynn, Douglas Adu, Dr Colette Grey, Dr Briga Hynes and Dr Yvonne Costin) collaborated with national and international colleagues on diverse research projects with a common gendered theme. The research spans the spectrum of firm size from examining the impact of women's human capabilities on growth in Irish SMEs to testing female executives' influence on sustainable business practices in publicly listed UK companies.

The policy implications of the SME study indicate that female entrepreneurs' human capabilities can be leveraged to maximise financial growth but generally not employment growth. Therefore, where employment growth is used as a qualifying criterion for entrepreneurial supports, it represents a barrier to access policy supports and initiatives for female entrepreneurs. Furthermore, for listed companies, the research shows that gender as a measure of

diversity in executive profiles has a positive impact on sustainable business practices in the form of reducing actual greenhouse gas emissions and reducing the gap between actual and self-reported measures of greenhouse gas emissions.

Strand 3:
Women in management
Strand 3 focused on women in management positions in organisations. Recent research indicates that in Ireland, the percentage of women on ISEQ 20 boards has more than doubled over the six-year period to 2021, when the 30% milestone of women on ISEQ 20 boards was surpassed (Balance for Better Business, 2021). Despite this significant increase, women still do not have the same representation as men on boards. Hence, the research team decided to explore whether women on boards have the same experiences as their male counterparts. KBS faculty who lead the school's Work Futures Lab sought to understand the experiences of women in management positions. They developed a 'Creating Work Futures' survey in 2021, which attracted over 1,000 responses from people working in a wide variety of industries in Ireland.

The survey found that as women move up through the hierarchical levels of the organisation, (i) their macro-decision authority is lower than that of their male counterparts; (ii) they have a greater workload than their male counterparts; and (iii) they report higher levels of burnout than do men.

Getting ahead versus getting along

Dr Deirdre O'Shea of KBS, UL and colleagues in Dublin City University and Technological University Dublin were awarded funding by the HEA in 2022 to investigate how gender stereotypes contribute to gender inequality in HEIs in Ireland. Despite decades of gender equality initiatives, there is still a need to make meaningful strides to balance the gender scales. It remains more difficult for women to experience the level and pace of success in academia experienced by their male counterparts.

Gender role stereotypes mean that the same behaviours and performance exhibited by men and women are interpreted differently. This has led some researchers to advocate that we need to "fix the game, not the dame", specifically in terms of how we evaluate leadership. However, past attempts to 'fix the game', such as introducing gender quotas, have been marginally successful at best.

To change the system, we need to change gender stereotypes, which follow from a societal division of labour whereby women have traditionally tended to be concentrated in communally demanding roles and men in agentically demanding roles. People's inferences of communal and agentic characteristics that underly typical work role behaviours of men and women yield gender stereotypes, which can be likened to the distinctions of 'getting along' versus 'getting ahead' as performance criteria, with 'getting ahead' performance criteria being more associated with leadership emergence and the stereotype of leaders as masculine.

Dr O'Shea and her colleagues assert that getting ahead performance criteria are emphasised to a much greater extent in academic performance and promotion contexts, thus disadvantaging women. This has substantial implications for how performance, promotion and hiring decisions are made in relation to academic roles. Primarily, it means that male and female academics are not evaluated in a similar way for the same behaviours. It also means that when faced with performance criteria that emphasise more stereotypical masculine (agentic) behaviours, females are disadvantaged. If women display more communal behaviours, they are perceived to not meet the performance criteria, and if they display more agentic behaviours, they are perceived to act out of line with their gender stereotypes and are thus also disadvantaged. The project will investigate these issues in a series of experimental studies.

Gender Identity and Gender Expression Policy

In January 2022, President Kerstin Mey launched the Gender Identity and Gender Expression Policy on behalf of UL's Human Rights, Equality, Diversity and Inclusion Office. The policy sets out UL's formal commitment to affirming every individual's gender identity and supporting their gender expression. UL will, at no time, discriminate against any individual on the grounds of their gender identity, gender expression or intersex status. UL is committed to ensuring that trans, gender diverse and intersex people are treated with dignity and respect. UL is committed to raising awareness of and providing education about gender diversity and strives to ensure that trans, gender diverse and intersex members of the institution experience UL as a positive environment. It is vital to provide a welcoming and supportive environment for students and staff

regardless of gender identity, gender expression or intersex status. Transitions are often highly individual, and there is no singular way to transition. Transitioning is an experience unique to that person, and each person's experience of the process can be different. UL is committed to ensuring an individual's right to privacy, including the right to keep one's gender identity private.

Gender balance on state boards in Ireland: To the forefront of progress or concealing the status quo?

In December 2022, KBS faculty members published an article in *Social Politics: International Studies in Gender, State and Society*. Dr Elaine Berkery and Dr Caroline Murphy collaborated with Dr Christine Cross, Edinburgh Business School, to examine female appointments to government-owned corporations – known as state-sponsored boards (SSBs) – in Ireland over a 28-year period and to analyse the extent to which gender parity has been achieved using voluntary gender targets. Using data from 34 SSBs, the authors found that overall figures relating to the achievement of gender parity on SSBs are masking the reality of female representation on these boards. The authors demonstrated that the high concentration of females on particular boards is increasing the overall average gender representation figures and, as a result, a high proportion of boards are not meeting their gender targets. This research provides evidence of the importance of taking a more nuanced approach to examining gender diversity on boards as a whole.

Giving Voice

"When contemplating sustainability, my thoughts naturally gravitate towards libraries. Libraries serve as vital, inclusive and equitable hubs within universities, catering to the needs of staff, students, local communities and the general public. They play an essential role in championing and cultivating sustainable practices across all facets of their operations. By their inherent design, libraries embody safety and sustainability. Every resource within their walls, from precious archival materials to print and digital collections, study space, technologies and educational instruction, finds purpose through reuse among the countless users they serve. In a library, nothing is single use, everything is shared, fostering a culture of collective benefit."

Louise O'Shea, Librarian, Library Spaces Manager

Ensure availability and sustainable management of water and sanitation for all.

6 CLEAN WATER AND SANITATION

Disruptive and energy-efficient approaches to producing clean drinking water

Dr Soumya Mukherjee's research group at the Bernal Institute and Department of Chemical Sciences is developing novel porous polymers to enable disruptive energy-efficient approaches to carbon capture, water purification, light hydrocarbon separation and toxic gas remediation. The project received SFI–IRC Pathway funding to help reduce the energy footprint of technologies that currently consume around 20% of global energy production (10% for chemical commodity purification and 10% for water purification).

UN projections suggest that an estimated 1.8 billion people will live in water-stressed areas by 2025, with two-thirds of them grappling with contaminated water. Current water contaminant levels are often found above the European safety levels, even across several developed countries. This study will focus on finding solutions to produce clean drinking water with low benefit-cost ratios.

Dr Mukherjee's work is laying the scientific groundwork for addressing the energy footprint of high-volume gas/vapour separations and water purifications. His research group, NanSorbLab, is based at the Bernal Institute and Department of Chemical Sciences.

Solar desalination: a low-cost solution to global clean water shortages

In collaboration with Massachusetts Institute of Technology, School of Engineering Marie Curie fellow Dr Joseph Mooney is exploiting novel porous materials that can convert seawater to fresh water using solar energy.

According to the World Wildlife Fund, two-thirds of the world's population may face water shortages by 2025. Water desalination technologies are promising solutions to the global water scarcity crisis. Solar desalination represents one of the most favourable low-cost, green and sustainable solutions to the pressing global challenge of clean water shortages and is vital for off-grid and remote island regions at risk of severe drought.

Through developing a better understanding of hydrogel materials, Dr Mooney's project (SEAFRONT) aims to produce a highly efficient, sustainable passive water purification device that will benefit people and industries across the globe who are water stressed. Hydrogels can absorb water and enable high solar-to-vapor conversion efficiencies while also providing anti-fouling properties. Studies on these state-of-the-art hydrogel materials are suggesting that further analysis into their underlying physics is essential for future developments.

Dr Mooney's research is funded by the European Commission's Marie Skłodowska-Curie Fellow Actions. He is conducting the study under the supervision of Professor Jeff Punch (UL), Dr Vanessa Egan (UL) and Professor Gang Chen (MIT). His project proposal received a 99.2% grade and ranked second in its category in Europe.

Predicting the antibacterial capacity of nanoparticles using a machine learning tool

KBS scholars used a machine learning tool to successfully predict the antibacterial capacity of nanoparticles. The emergence and rapid spread of multidrug-resistant bacteria strains, which are caused by the overuse and misuse of antibiotics, are a public health concern. Nanoparticles are objects with all three external dimensions in the nanoscale of 1 to 100 nanometres (nm). Research on nanoparticles with enhanced antimicrobial activity as alternatives to antibiotics has grown due to the increased incidence of nosocomial and community-acquired infections caused by pathogens.

Machine learning tools have been used in the field of nano informatics with promising results. Because of evident achievements on a wide range of predictive tasks, machine learning techniques are attracting significant interest across a variety of stakeholders. Compiled after a literature review of 60 articles, the data comprises key physico-chemical (p-chem) properties and experimental conditions (exposure variables and bacterial clustering) from in vitro studies. Following data homogenisation and pre-processing, the researchers trained various regression

algorithms and validated them using diverse performance metrics. Finally, an important attribute evaluation, which ranks the attributes that are most important in predicting the outcome, was performed. The attribute importance revealed that nanoparticle core size, the exposure dose and the species of bacterium are key variables in predicting the antibacterial effects of nanoparticles based on their p-chem properties and diverse exposure settings. This concept also aids the safe-by-design paradigm by incorporating functionality tools.

Giving Voice

"Grappling with new subjects is a universal challenge for university students. The Glucksman Library plays a key role in expanding our collective knowledge and understanding of sustainability. By co-creating sustainability literacy guides with expertise from our faculty, staff and student body, we emphasise the acquisition of knowledge in a specific field. As educators, it is our responsibility to share our knowledge and assist others in learning new subjects."

Michelle Breen, Head of Learning and Engagement, UL Glucksman Library

Ensure access to affordable, reliable, sustainable and modern energy for all.

7 AFFORDABLE AND CLEAN ENERGY

Rehabilitating legacy waste sites and improving ecosystems in restored industrial lands

Moving society towards a more holistic approach to health and clean energy will require significant increases in the demand for raw materials and production of associated waste and residues. Currently, the disposal and management of these wastes occupies a land footprint of circa 2,000 km2 and can present risks to the environment and challenges the sustainability of resource supply.

Research led by Dr Ronan Courtney at the School of Engineering and Bernal Institute is investigating valorisation and repurposing of these wastes. Dr Courtney's work addresses the restoration and rehabilitation of legacy waste sites and how ecosystem services in restored industrial lands can be improved. By characterising and assessing different waste streams, inhibitory and restrictive properties can be overcome, beneficial characteristics identified and repurposing value chains identified. The research team at UL has pioneered and implemented techniques for creating engineered soils from waste materials and using natural systems for resource recovery. This has led to industries implementing these techniques as an industrial standard globally.

The societal, environmental and economic impacts of Dr Courtney's research include mitigation of pollution risks, restoration of degraded areas and rejuvenation and enhancement of surrounding ecosystems, implementation of increased biodiversity biological carbon sequestration, improved sustainability of resource supply and circular economy implementation at source. These projects are funded by several sources, including SFI, Environmental Protection Agency, Enterprise Ireland, the IRC and industry.

Dr Ronan Courtney is a lecturer at the Department of Biological Sciences and a member of the Bernal Institute.

Understanding construction materials to make energy generation safer

Professor Noel O'Dowd uses modelling and testing methodologies to find the best materials for engineering applications such as power generation and aerospace. This research initiative will provide an understanding of how materials fail and how to predict and prevent such failures. The findings could make energy generation safer and more efficient with reduced environmental impact.

The SFI-funded study involves partnerships with the ESB and Wood in Ireland and partners outside Ireland. Professor O'Dowd's expertise lies in developing material models and predicting the service behaviour of materials using finite-element analysis.

Professor O'Dowd is a Chair of Mechanical Engineering at the School of Engineering and Bernal Institute.

UL accommodation targets sustainable student behaviour through energy management

While sustainable changes are being made at a facility level with fixes such as LED lightbulbs and timed heating, change must also be made through student behaviour. This is a difficult area for producing tangible results, and changes are planned to impact energy consumption behaviour gradually over several years.

One change planned was the collaborative goal from Optimising Power @Work, Tipperary Energy Agency and UL Buildings and Estates to decrease resident consumption of energy through awareness over personal and communal usage. As part of a Campus Life Services campaign, energy stickers were introduced in pilot accommodation blocks in autumn 2022. The stickers operate on a 'traffic light' system and are placed on or near electrical switches to encourage residents to reduce their energy consumption by remembering to switch off appliances when not in use. Green stickers are placed on appliances such as TVs or speakers to turn them off after use rather than letting them go to standby. Orange stickers are placed on lights or electrical heaters to switch off when you are leaving a room, and red stickers are placed on items that should never be switched off, such as the fridge. During the sticker test period, the pilot apartments showed 5.4% less energy consumption compared to the average consumption by non-stickered blocks in the same period.

The campaign also offered students the chance to sign up to be an 'Energy Champion' in residence with a pledge to reduce and encourage energy saving in residence. Ninety-five residents signed up to the scheme in autumn 2022. Participants were offered

incentives for overall reduction in energy in their specific villages and invited to connect with their fellow energy champions to discuss their shared interest in green living. At the end of the semester, one champion was selected from the village with the least energy usage and was awarded a sustainability hamper.

"The campaign is a good initiative, everyone has to do their part, and this helps, hopefully in a major way. I signed up to be an energy champion for our house and it's really helping us try harder to save", one resident explained. Another concurred: "I think it's important to be mindful of our energy usage and your energy reduction campaign is a good idea!"

Through this campaign, all in-house students receive monthly emails specifically related to energy management with helpful tips on reducing energy and targeted 'shutdown' campaigns around times when students may be absent for long periods, such as at Christmas and Easter. The shutdown campaigns serve as a reminder to residents to switch off all electrical appliances, unplug items and ensure waste is removed before leaving their accommodation.

UL-developed grid stabilisation technology to power state-of-the-art facility in Midlands

Initially developed at UL, grid stabilisation technology is set to power a new facility in the Midlands. When completed, the new 'Shannonbridge B' grid stability plant will provide an additional 170MWh of hybrid capacity to the national electricity grid.

The €130m hybrid facility – developed by Lumcloon Energy (Ireland) and Hanwha Energy (Korea) – will combine a long-duration battery with a synchronous condenser flywheel for the first time. The state-of-the-art facility was launched in September 2022 by the Taoiseach, Micheál Martin TD. With its origins in pioneering research undertaken by the Department of Physics, the plant will help stabilise the electricity grid; respond to demand for renewable energy, such as wind and solar energy; and support greater energy independence.

The effectiveness of combining battery technology with a flywheel was first demonstrated during an Enterprise Ireland Innovation Partnership between Nigel Reams, current MD of Lumcloon Energy, and the Department of Physics. Dr Robert Lynch, course director of the BSc in Applied Physics and advisor to Lumcloon Energy, explained: "We developed and tested a pilot plant that was connected to the grid, which demonstrated the feasibility of using flywheels and batteries to support the electricity grid during events. From our research, we showed several significant advantages and synergies of combining synchronous condenser flywheels with battery storage to provide stabilisation of the electricity grid and following our advice, Lumcloon Energy will soon begin the building of such a facility at its Shannonbridge B plant."

Dr Lynch explained that, although batteries can deliver very rapid frequency response, reserve and ramping services, synchronous condensers provide low carbon inertia that bridges the time required for batteries to react to any sudden loss in electricity supply or surge in demand. Mr Reams said, "We develop projects focused on accelerating the decarbonisation of the Irish energy sector, which will increase the stability and reliability of the power grid and provide essential backup to support renewables. Shannonbridge B is another major step in the right direction for Ireland's power grid and will facilitate the increasing amount of renewables on the system."

The project will create around 150 jobs over the two-year construction phase and support 15 jobs on completion. Construction of the Shannonbridge B facility is due for completion in late 2024.

Bringing advanced energy materials closer to practical applications for better batteries

Dr Hugh Geaney's research group at UL is developing better batteries through advances in materials science. Dr Geaney's research focuses on different chemistries (Li-ion, Li-metal and beyond Li-ion) and aims to diversify the range of batteries for various applications.

Current Li-ion batteries are high-performing devices that have been incrementally improved over decades to the point where they are suitable for long-range electric vehicles (EVs). Dr Geaney seeks to move beyond this technology by understanding the evolution of active materials during the battery lifecycle to enable better batteries to be designed. His group has made significant progress in bringing advanced energy materials closer to practical applications, thereby making the transition from fossil fuels to renewable energy sources easier.

Dr Geaney was recently awarded the UL President's Research Excellence and Impact Award for Early Career Researchers (Consolidator Category). He is a lecturer in the Department of Chemical Sciences and a member of the Bernal Institute. His research is primarily funded through the SFI Starting Investigator Research Grant (SIRG) scheme. He also received funding from the IRC Sustainable Energy Authority of Ireland (SEAI), Enterprise Ireland, Horizon2020 and EU Horizon.

Bernal Institute researcher in attendance at Nobel Laureate meeting

Bernal researcher Dr Ibrahim Saana Aminu attended the 71st Lindau Nobel Laureate Meeting in July 2022. Once every year, Nobel laureates convene in Lindau to meet the next generation of leading scientists for cross-generational and interdisciplinary exchange.

Dr Aminu is an award-winning chemical scientist and a Marie Curie Fellow with expertise in semiconductor nanowire materials for energy storage applications. He is a Research Fellow at the Department of Chemical Sciences within Professor Kevin Ryan's Nanotechnology research group. His experience incorporates the development of 'batteries for the future' to meet demands from the market-dominant EV industry.

Dr Aminu participated in a H2020 Marie Curie-funded project to develop advanced rechargeable aluminium-ion batteries (AIBs) using low-cost and sustainable components. The study led to the discovery of a rapid technique to fabricate a novel graphite material with an unprecedented 'brain-like' morphology, including mechanisms to control the porous architecture. This novel graphite shows promise for a potential breakthrough in advanced graphitic cathodes for AIBs.

Dr Aminu recently received SFI Industry RD&I Fellowship funding to pursue research at Analog Devices, Limerick on the design and characterisation of materials for advanced magnetic sensors for the automotive, fibre optic, computer and medical devices industry. The project will reduce new technology development cycle time and accelerate the speed at which Analog Devices gets its products to the market and will have a direct impact on revenue and global competitiveness within the semiconductor industry. Dr Aminu believes that artificial intelligence (AI) in chemistry will play a pivotal role in the future of science.

Using machine learning and AI to improve the efficiency of power plants

To reduce our carbon footprint, we must operate power plants at maximum efficiency and extend the service life of critical material components simultaneously. Dr Alison O'Connor, Marie Skłodowska-Curie Fellow at the School of Engineering, hopes to improve the efficiency of power plants by using machine learning and AI.

Material component damage is complex and depends on three key factors: loading conditions, environmental conditions and specific material properties. The complexity happens when these key factors start to interact with one another; for example, the strength of steel and its mode of failure can change depending on the test temperature. Similarly, the life of a component is reduced if it is in a corrosive environment such as seawater. Currently, scientists and engineers analyse service life by assuming the worst-case scenario. Dr O'Connor aims to use machine learning algorithms to assess how these complex multi-interactive factors inform the rate of damage in the material. The machine learning algorithm can identify unknown parameter values more efficiently and accurately than humans.

The data generated from these tools can be used to ensure that structural integrity and, therefore, safety is maintained to the highest level but will enable us to reduce our overall carbon footprint. This will contribute directly to a greener climate.

Electronics project receives prestigious ERC grant

Dr Sarah Guerin, a postdoctoral researcher at the Department of Physics, was awarded a highly prestigious ERC grant worth €1.5m for a project entitled 'Pb-Free: Piezoelectric Biomolecules for Lead-free, Reliable, Eco-Friendly Electronics'. The project will investigate if electronics could become lead-free, reliable and eco-friendly.

"Piezoelectric sensors sound exciting, and indeed they are! Used to interconvert electrical and mechanical energy, they are essential to many common devices that we rely on – pacemakers, microwave ovens, sonar equipment, diesel fuel injectors in cars", Dr Guerin explained. "Piezo sensors are often used to measure a change in pressure, acceleration or strain by converting them into electrical charge. However,

they also have a huge environmental cost. Their production involves using toxic lead oxide, and the main alternatives to lead involve using expensive, non-renewable materials – also quite undesirable. In recent years, biological materials such as amino acids and peptides have been recognised as exciting new piezoelectrics. Gathering them into biomolecular-crystal assemblies could offer a revolutionary way to create these essential sensors."

Dr Guerin added that "Crystals can be grown at room temperature with no by-products and do not require an external electric field to induce piezoelectricity. Right now, however, no one knows how to develop these crystals as reliable, solid-state sensors that could be used in conventional electronic devices. Their high-water solubility, uncontrolled growth, variable piezoelectric response and difficulty in making electrical contact pose too high a challenge."

Dr Guerin is also a researcher at SSPC, the SFI Research Centre for Pharmaceuticals based at UL. She will take on the groundbreaking task of developing biomolecular crystals as a new type of piezoelectric sensor. "Such organic, low-cost, high-performance sensors would out-perform and ultimately lead to the phasing-out of inorganic device components – with dramatically reduced environmental impact. I am delighted to be awarded this grant and am excited to establish a world-leading research group in Ireland. The acceleration of eco-friendly piezoelectric technologies will be of huge importance to the Irish economy while greatly reducing the environmental impact of electromechanical sensing technologies worldwide. I look forward to attracting diverse talent to the west coast and pushing the boundaries of materials science research", she added.

According to ERC President Professor Maria Leptin, "Letting young talent thrive in Europe and go after their most innovative ideas – this is the best investment in our future, not least with the ever-growing competition globally. We must trust the young and their insights into what areas will be important tomorrow."

Dr Guerin is one of two UL researchers to be in receipt of this ERC grant. The project of the other recipient, Dr Eoghan Cunnane, was described earlier in this report.

Student Showcase

ThermAL BridgE ReducTion - **Mihai Penica and William O'Brien**

(Shortlisted for Sustainability Challenge)

With energy prices skyrocketing and an ever-growing demand for more energy, ensuring that our buildings retain heat as efficiently as possible is paramount in the face of the climate crisis.

Students Mihai Penica and William O'Brien (CONFIRM) hope to address the issue of energy inefficiency in Ireland's buildings by using thermal imaging drones to identify where insulation can be improved. In addition, they aim to use the collected data to obtain the max solar energy (kilowatt-peak (kWp) – this term is used when referring to solar PV panels) output for the dwellings passed. They plan to use thermal mapping and AI analysis to create an open-source map so that residents can visualise the amount, location and cost of waste heat leaving their homes – and take action to make their homes more energy efficient.

"Mihai and I are delighted to be selected as one of the finalist teams to take part in the UL Sustainability Challenge", said team member William O'Brien. "Our hope for this project is that we can show off how AI, drone and thermal imaging technology can be paired together in a way to reap the benefits of a sustainable environment", he continued. "We will be targeting UN SDG 7, which is ensuring access to affordable, reliable, sustainable and modern energy for all. Through the development of an online geospatial platform, our goal is to empower energy consumers by equipping them with a tool that offers information on potential energy savings through the implementation of home upgrades."

Student Showcase

Clean, accessible, renewable and energy-efficient energy: metal-free catalysts to the rescue – **Niamh Terranova and Raju Lipin**

(Shortlisted for Sustainability Challenge)

The brainchild of Niamh Terranova (second-year undergraduate, BSc in Applied Physics) and Raju Lipin (second-year PhD candidate, Department of Chemical Sciences), the CARE (clean, accessible, renewable and energy-efficient) project aims to produce clean, sustainable and affordable hydrogen gas to address rising emissions and the ever-growing demand for more energy. Niamh and Raju hope to achieve this by replacing the expensive and scarce platinum catalysts currently used in hydrogen production with metal-free, environmentally friendly alternatives that could reduce costs and waste. The pair will collaborate with Mesoscale Chemical Systems Labs and University of Twente, Netherlands on their project.

According to UL Vice President Research Professor Norelee Kennedy, "The partnership between doctoral and undergraduate students Raju Lipin and Niamh Terranova demonstrates the opportunity to connect with research from the very beginning of the academic journey at UL. By engaging with University of Twente, the team is seeking to bring their theories to life and offer new knowledge to the clean energy challenge. Their global perspective to partnering in solving a grand challenge illustrates the great power of the connected and open research community."

The Energy Transition Board Game - **Carla Colin**

Climate change has dominated concerns around dependency on fossil fuels to produce energy. Currently, however, that dependency is jeopardising energy security in the Eurozone. The transition to clean energies is vital to tackle these concerns. Some of the strategies include the deployment of domestic technologies to produce clean energy. In Ireland, the perpetual accommodation crisis inspired the direction of Carla Colin's work, the aim of which is to better understand how people who do not own a house can access clean energy technologies to become prosumers (individuals who both produce and consume).

To understand the concepts involved in this project, the literature review focused on energy production, energy transition acceleration and the housing situation in Ireland. The research is based on an analysis of blog posts created by 44 UL first-year students between 2021 and 2022 in response to the question "What are you and your family doing to address the energy crisis and climate change?". These were pulled from a list of almost 200 posts created by students of Carla's supervisor, Dr Gabriela Avram, from a variety of bachelors programmes at UL. The analysis of the blog posts gave rise to three distinct levels of energy citizenship according to the students' energy consumption or the use of technology to produce energy. In addition, interviews with experienced prosumers were held, which concluded in a prosumer taxonomy proposal.

Carla's interactive proposal to persuade end users to become prosumers takes the form of a board game. She developed the Energy Transition Board Game for her thesis project as part of the MA in Interaction and Experience Design. The game focuses on the more mainstream everyday activities that require energy and, therefore, money. Carla's idea was to put on the table human needs, technology and the economy and how it relates to energy.

The game presents players with concepts considered necessary to understand energy transition. The players start at the centre of the board, living in rented accommodation and depending on the central energy grid. To decentralise the grid, they will try to get to the furthermost points to move from energy consumers to energy prosumers. Question cards on energy consumption and production let the players generate income to achieve their prosumer goals. The way to earn money is randomised by the type of citizenship assigned by the dice, and the mechanics given on the needs, appliances and technology cards make the players look at the topic as a complex system and pay attention to the hand they can play with the resources they have. When a blackout card comes out, the game is over, at which point all players will see where they are in relation to the energy transition.

Giving Voice

"Sustainability touches into every aspect of our lives as well as the well-being of our environment and whole world around us. It ties in all people from society and is a responsibility we all have to ensure a better and growing future for everyone and everything! Students are the future so we have the chance to shape and impact the ideal future we want to see. Sustainability now gives us this opportunity to collaborate and work towards a more positive world in all aspects!"

Ronan Cahill, incoming UL Student Life President (2023/24)

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

8 DECENT WORK AND ECONOMIC GROWTH

Bernal director welcomes Shannon Foynes floating offshore wind plan

Bernal Institute Director Professor Luuk van der Wielen welcomed the launch of Shannon Foynes Port Company's floating offshore wind plan. A member of the Shannon Estuary Economic Taskforce, Professor van der Wielen attended the launch of the plan on 4 November 2022 along with Ray O'Brien, Business Development Manager at the Bernal Institute.

The plan was launched in the presence of Minister Eamon Ryan and the members of the Shannon Estuary Economic Taskforce, who were appointed by the government to assess the strategic strengths and comparative advantages of the Shannon Estuary and to scope out potential economic opportunities for the area.

The Shannon Foynes Port Company launched the new plan as part of its Vision 2041 Strategic Review. Produced by Bechtel Ireland, the plan details scenarios for developing up to 30 GW of floating offshore wind from the Shannon Estuary. It also outlines energy generation scenarios and onshore green industrial integration. Paul Deane, project lead at Bechtel Ireland, indicated that the consultations with Professor van der Wielen and the wider Bernal team "were very beneficial to the report, particularly with respect to circularity and innovation; they are both powerful messages and opportunities for the region."

The plan offers many opportunities for research, development and innovation as well as professional education with regional academic institutes such as UL, TUS and MTU. According to Professor van der Wielen, "At University of Limerick and Bernal Institute, we are strategically committed to the sustainable economic development of the region and Ireland in the European context. We are looking forward to supporting further development opportunities around the projected Wind Turbine Blade Manufacturing and Recycling Innovation Hub, manufacturing of sustainable aviation fuels, chemicals and circular materials, many elements of the FLOW supply chain and other opportunities. This is a daring yet realistic plan."

UL Entrepreneurship and Innovation Awards March 2022: Celebrating and fostering sustainable entrepreneurship development

The UL Consulting and Entrepreneurship Society, UL Foundation and Kemmy Business School were delighted with the calibre of competitors in the 2022 University of Limerick Entrepreneurship and Innovation Awards. The focus of this initiative is to demystify the journey of being a student entrepreneur and celebrate the existing vibrancy of entrepreneurial endeavour on campus.

The initiative was enabled by the generous donation of funds and expertise from Platt Reilly and Ingenium Training & Consulting – two supporters of the UL Foundation. It was further supported by Dr Briga Hynes of Kemmy Business School and Ben Fitzgerald Kiely, President of the UL Consulting and Entrepreneurship Society (2019–2022). The awards programme was delivered to students in a hybrid manner, focusing on digital resources to educate and engage participants on the UN SDGs as well as delivering in-person clinics and feedforward and feedback sessions that presented participants with excellent learning opportunities.

The project continues to go from strength to strength, and the addition of a 'Social Impact' category was well received. Participants were asked to respond to a list of challenge statements with a view to tackling SDGs by focusing on the problem being solved, describing the solution and its benefits and providing evidence and validation that their idea was feasible. They also had to demonstrate their ability to communicate by moving from simply elaborating on a prepared presentation to examining the investment readiness of their idea, and judges graded the submissions based on the likelihood of investing €3,000 in each pitch. The calibre of submitted ideas was strong, and feedback from students and judges alike was very positive.

Dr James Ring, CEO of Ingenium, said, "Once again, Ingenium is delighted to sponsor and be involved in this fantastic event. Watching the next generation of young entrepreneurs emerge and being able to support them on their growth journey completely aligns with Ingenium's mission, and we wish all the participants the very best of luck in their budding careers."

On the day of the awards, Dr Hynes commented that "This is more than a competition as it mirrors the real-life investment process immersing students in a personalised authentic startup experience. The very high quality of the applicants demonstrates the commitment and passion students have for innovation and actively taking the next step towards turning ideas into commercially and socially viable businesses."

Ben Fitzgerald Kiely indicated that he found it "refreshing to see new ideas and ways of thinking that not only meet the challenges of today but are sustainable to meet future needs. The range of disciplines represented is an excellent presentation of the fact that 'entrepreneurialism' is not a business-orientated term, and it is uniquely positioned to span across faculties, domains and backgrounds."

This awards initiative is one of a range of entrepreneurship and innovation initiatives available to deepen the enterprise culture across the student and researcher population and build a diverse pipeline of young entrepreneurs and innovators.

Technology and the quality of work

A research team from the KBS Department of Work and Employment Studies (Dr Michelle O'Sullivan, Dr Caroline Murphy, Dr Jonathan Lavelle, Dr Lorraine Ryan, Dr Juliet MacMahon and Professor Tony Dundon) engaged in a research partnership with the Financial Services Union to investigate the impact of technology on job quality in the financial services sector. Involving interviews and a survey of over 1,000 employees, the research traversed the period before and after the COVID-19 pandemic and took place in a context of significant organisational restructuring and job losses in banking.

The research led to three reports: (i) employees' experiences of remote working during the pandemic; (ii) employees' experiences of and attitudes to technological surveillance of their work; and (iii) the impact of technology on skills, workload and job security. The research found concerns over work extension, which refers to the encroachment of work on private time through ever-present connectivity, and this influenced the union's objectives and organising initiatives, including a campaign seeking regulation on the right of employees to disconnect from work technology. Union lobbying successfully led to the government launching the Code of Practice on the Right to Disconnect in 2021. Comprising a statutory set of guidelines, the code of practice provides employees with the right to disengage from work and work-related electronic communications and the right to not be penalised for refusing to attend to work matters after normal working hours. The research also found that employees were positive about remote working but were concerned about the lack of employer financial support with expenses relating to working from home. The union initiated a campaign seeking employers to provide financial assistance to employees.

Job quality for older women

A group of researchers comprising Dr Jonathan Lavelle (KBS, UL), Dr Maeve O'Sullivan (UCC) and Dr Christine Cross (Edinburgh Business School) undertook important research on the job characteristics of a cohort we know little about – older female part-time workers. To date, research on female part-time employment has focused mainly on younger women; few studies have addressed the part-time employment of older women. The research explored whether older female part-time workers, who have high employment rates, are likely to be more vulnerable because of the combination of age, gender and employment status.

Findings reveal notable differences between this cohort's job characteristics and those of other part-time workers and older women working full-time. These job characteristics include low-wage employment in poor-quality jobs, which suggests that job quality is influenced by age, gender and employment status and raises concerns regarding the likelihood for precarious employment among this cohort. In addition to individual-level consequences, the study's findings have major implications for public and organisational policy on part-time labour market participation, which points to the need for a new research agenda on older workers. The findings contribute to advancing our knowledge of issues relating to SDG 5, Gender Equality and SDG 8, Decent Work and Economic Growth.

Does Ireland need stronger wage theft laws? An assessment of minimum wage and working time legislation

Led by Dr Michelle O'Sullivan, KBS academic staff hosted an informal, interactive seminar on assessing minimum wage and working time legislation. Recent

international scandals have drawn attention to wage theft, which refers to the non-payment of wages for work performed. Walmart in the USA paid more than US$1.4 billion in fines and settlements for wage theft since 2000 while Woolworths in Australia was found to have underpaid staff by $300m, which led to a spate of new employment laws on wage theft in those countries.

In Ireland, trade unions and migrant rights organisations have called for stronger legal protections for workers who experience wage theft. Other than the recent debate about tipping practices in hospitality, there have been few policy discussions about the extent of wage theft in Ireland and the effectiveness of existing employment laws in providing remedies for wage theft. The KBS seminar considered whether or not Ireland needs stronger wage theft laws by assessing the effectiveness of minimum wage and working time employment laws in providing a remedy for workers. The findings are based on an analysis of 214 complaints made by workers under the National Minimum Wage Act 2000 and Organisation of Working Time Act 1997 to the Workplace Relations Commission and Labour Court. The analysis reveals that many measures arising from new wage theft laws in other countries are already contained in the Irish minimum wage and working time laws, which suggests that radically new employment laws in Ireland are not needed. However, the current laws have several significant weaknesses that act as barriers to workers who have been underpaid.

Creating the future by investing in the present

The KBS Department of Economics hosted members of the European Investment Bank, Europe's climate bank, in an attempt to figure out how Limerick can be decarbonised. Participants with a unique set of perspectives, from local and national governments to finance and universities and from architects to artists, convened in UL's City Campus on 11 February 2022 to try to come up with a solution.

The symposium was a first for Limerick in terms of welcoming members of the European Investment Bank to the city and a first for UL in terms of hosting the event in the new City Campus. Commenting on the event, Head of Department Professor Stephen Kinsella said, "Economics is the study of choices – how choices are made, what trade-offs are present, who wins and who loses. The coming generation of students will confront climate change head on, so it was wonderful to bring such a diverse set of speakers together to help them understand the nuances of the issue, from the very local to the truly global. It was also a privilege to make a small part of UL's history in producing the first symposium in the UL City Campus."

Giving Voice

"From my perspective, sustainability is very important; it provides an opportunity for academic and research communities to be a platform to help develop a sustainable mindset by embedding the Sustainable Development Goals into courses, practices and teachings. Sharing knowledge on the impacts of human actions and emphasising our legacy on the planet can empower future changemakers. Policy can be influenced by disseminating research results on how to use natural resources responsibly and ensuring the balance between economic growth, environmental care and society."

Dr Sinéad Mellett, Industry 4.0 Programme Manager, CONFIRM Centre

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Exploring the capabilities and limitations of metal 3D printing

Metal 3D printing offers the flexibility to produce complex geometry parts. The possibilities to design and produce customised metal parts for many applications and better products are endless. Moreover, the recyclability of metal powder in laser-based additive manufacturing systems makes the production process highly sustainable, particularly for high-value metals, such as titanium.

Dr Kyriakos Kourousis's research group at the Bernal Institute is exploring the capabilities and limitations of metal 3D printing by answering questions such as how the metals behave when pushed beyond their elastic limit, what is the best set of 3D printing parameters to achieve minimum plastic anisotropy, and which plasticity model can best match the properties of 3D printed metals. Answers to these technical questions will enable engineers to design 3D products that are lighter, more energy efficient and affordable, and safer.

In engineering, 'plasticity' describes what happens to metal in response to the application of a force that is strong enough to cause a permanent change to the metal's shape but not strong enough to break it. Plasticity can be manipulated but can also be the source of faults.

Dr Kourousis is a senior lecturer in the School of Engineering and programme director for the airworthiness postgraduate programme. His research expertise lies in metal plasticity, additive manufacturing and airworthiness.

Novel transmission electron microscope technique developments at the Bernal Institute

Led by Professor Ursel Bangert, Bernal Chair in Microscopy and Imaging and member of the Department of Physics, a group of Bernal Institute researchers is engaged in novel transmission electron microscope (TEM) technique developments. The work involves TEM imaging and spectroscopy measurements, revealing individual atoms and their behaviour on the sub-atomic (sub-Angstrom) scale. The novel technique enables in-situ measurements (in liquids and gases, under cryogenic, heating and biasing conditions) to be taken and reactions in real-time (acquiring up to 1,600 frames per second) to be monitored.

According to Professor Bangert, "During my early employments as post-doctoral researcher in University of Surrey and the University of Manchester (starting in 1982), I coincidentally slipped into research based on electron microscopy. This did not at all follow the directions of my physics degree and PhD, but I never regretted having been diverted into this area. I noticed then that to understand the fundamentals of physics and chemistry of materials, the revelation of their atomic structure down to a level, where the behaviour of individual atoms is being visualised, is a necessity; this was also totally in line with my adoration of art and imagery." Today, Professor Bangert's studies using a €9m TEM (currently one of a handful in the world) in the Bernal Institute are making an impact on global materials science research.

In 2021, another study harnessing TEM observations revealed the nucleation and formation of pharma-crystals and their polymorphs. A full and fundamental understanding of this can be achieved only by observing or establishing crystal growth on the atomic scale directly while the crystals are forming during chemical reactions, i.e., in solutions, and techniques that can enable direct observation of early-stage crystallisation are needed to gather an in-depth view of the individual stages of active pharmaceutical ingredients crystallisation and, generally, of the crystallisation of small molecular crystals. The outcomes of this research will lead to large-scale production of medicines with more reliable efficiency.

In May 2022, Professor Bangert received €351k of SFI funding to develop a new class of 2-D materials – 2-D ferroelectrics – which have the potential to be essential components in novel, revolutionary nano-devices used in memories, sensors and energy storage. 2-D ferroelectrics may contain conducting atomic-scale channels, which could be used as mobile/electrical and novel line switches to address individual components (e.g., single photon emitters) in nano-devices.

Imagining new applications for nanomaterials

Finding the means to fabricate and analyse nanomaterials is critical for advancing medical sciences, energy technologies, engineering and new product development across many applications. Advanced technologies enable researchers to investigate sensitive nanomaterials for various applications, including super-resolution to facilitate

biological imaging at the nanoscale and emerging class of fluorescent materials and devices that will advance LED performances.

Physicists Dr Ning Liu and Dr Christophe Silien (Department of Physics and Bernal Institute) are leaders in photonic optics research. Dr Liu is working on electrically pumped nanocrystal-based light-emitting diodes, spin-orbit coupling of light, nanophotonics and nanoplasmonics; this work will lead to better gaming experiences and better internet connections. Dr Silien was awarded SFI funding to help strengthen Ireland's knowledge base in the photonics and medical device sectors and to enhance knowledge on the cellular origin of diseases and aid diagnostic and therapy monitoring.

Challenging fundamental understandings of crystalline materials

Crystalline materials are common in everyday life: they are present in most drugs and agrichemicals as well as in photonic and electronic components for energy harvesting and data storage/communication. Dr Matteo Lusi, lecturer in crystallography at the Department of Chemical Sciences and Bernal Institute member, believes that "Crystals are magnifying glasses for molecules and proteins", and his research investigates the limits of crystallinity.

Dr Lusi has focused on disordered and dynamic systems that move, react together and mix to create solid solutions. His research has already challenged some fundamental understanding of how molecules and ions interact in the solid state. In the long term, such new knowledge may translate into tangible chemical and physical properties to create new crystalline materials with predetermined properties and functions.

Due to technological limitations, traditional crystallography can render only the average position of the atomic nuclei in the ideal solid. Dr Lusi's hope is that "scientific advancements will soon enable us to resolve local defects and show how electrons move around the nuclei. That possibility will revolutionise our view of molecules and the crystalline state."

UL academics appointed to Shannon Estuary Economic Taskforce

UL is strongly represented on the Shannon Estuary Economic Taskforce. In April 2022, Tánaiste and Minister for Enterprise, Trade and Employment Leo Varadkar announced the formation of the taskforce, which includes Professor Luuk van der Wielen, Director of the Bernal Institute and Professor Emeritus Eamonn Murphy, Chair of Mid-West Regional Enterprise Plan. The new taskforce will assess the strategic strengths and comparative advantages of the Shannon Estuary and scope out potential economic opportunities for the area. The group will produce a report that specifies actions to create jobs and secure investment along the estuary and in its vicinity.

The Programme for Government has committed to supporting the Shannon Estuary and surrounding area by establishing the taskforce to evaluate the potential of the area and determine how this potential can be realised. To fulfil this commitment, the terms of reference of the taskforce include assessing the strategic strengths and comparative advantages of the Shannon Estuary from an investment and enterprise development perspective in a national and international context as well as the current connectivity of the region and making recommendations as to how these could be enhanced. The taskforce will scope potential areas of opportunity for the Shannon Estuary and specify policy, investment and actions required from national and local government and other stakeholders to exploit these areas of potential.

Following on from the taskforce's first meeting in May 2022, chairperson Barry O'Sullivan said, "It is evident from the broad range of expertise around the table that there is the potential to put forward an ambitious and innovative body of work to help shape the future development of the Shannon Estuary region and the broader economy nationally."

The taskforce report and associated action plan, which will include specific steps in areas of potential, is due at the end of 2022 and will be presented to the Tánaiste and Minister for Enterprise, Trade and Employment for consideration by the government.

Breakthrough discovery of organic material that 'remembers its history'

A breakthrough discovery at UL revealed for the first time that unconventional brain-like computing at the tiniest scale of atoms and molecules is possible. Bernal Institute researchers worked with an international team of scientists to create a new type of organic material that learns from its past behaviour. The discovery of the 'dynamic molecular switch' that emulates synaptic behaviour was revealed in a new study in the prestigious international journal Nature Materials in November 2022.

The study was led by Damien Thompson, Professor of Molecular Modelling in the Department of Physics and Director of SSPC, SFI Research Centre for Pharmaceuticals; Professor Christian Nijhuis, Centre for Molecules and Brain-Inspired Nano Systems at the University of Twente; and Dr Enrique del Barco, University of Central Florida. Working during lockdowns, the team developed a two-nanometre thick layer of molecules, which is 50,000 times thinner than a strand of hair and remembers its history as electrons pass through it.

Professor Thompson explained that the "switching probability and the values of the on/off states continually change in the molecular material, which provides a disruptive new alternative to conventional silicon-based digital switches that can only ever be either on or off".

The newly discovered dynamic organic switch displays all the mathematical logic functions necessary for deep learning, successfully emulating Pavlovian 'call and response' synaptic brain-like behaviour. The researchers demonstrated the new materials' properties using extensive experimental characterisation and electrical measurements supported by multi-scale modelling spanning from predictive modelling of the molecular structures at the quantum level to analytical mathematical modelling of the electrical data.

To emulate the dynamical behaviour of synapses at the molecular level, the researchers combined fast electron transfer (akin to action potentials and fast depolarisation processes in biology) with slow proton coupling limited by diffusion (akin to the role of biological calcium ions or neurotransmitters).

The researchers explained that since the electron transfer and proton coupling steps inside the material occur at very different time scales, the transformation can emulate the plastic behaviour of synapse neuronal junctions, Pavlovian learning and all logic gates for digital circuits simply by changing the applied voltage and the duration of voltage pulses during the synthesis.

UL and Lero researchers show how advanced driver assistance systems could reduce number of car crashes

Researchers at UL and Lero, the SFI Research Centre for Software, have found that installing advanced driver assistance systems in cars in Great Britain could reduce the number of car crashes by 24%. The researchers from Lero – at UL and Motion-S, Luxembourg – found that automatic emergency braking is the most impactful technology. It reduces the frequency of accidents in three of the four most common accident categories – intersection (by 28%), rear-end (by 27.7%) and pedestrian (by 28.4%). The research team believes similar results could be achieved in Ireland. Based on publicly available road safety reports from Great Britain for 2019, the team estimates that a full deployment of advanced driver assistance systems (ADAS) would reduce accident frequency in Britain by 23.8%, representing an annual decrease of 18,925 accidents.

According to Dr Barry Sheehan of Lero at UL, "Our research suggests that introducing ADAS across all vehicles would lower the number of road crashes by almost one quarter (23.8%). Furthermore, accidents happening in the two most frequent contexts can be reduced by 29%. That means a reduction of 7,020 accidents on urban roads with clear weather and daylight conditions and 3,472 on rural roads with clear weather and daylight conditions."

Existing research shows that connected and automated vehicles are expected to improve road safety substantially, including reducing accident frequency and severity. According to the American Automobile Association, as of May 2018, 92.7% of new vehicles in the United States have at least one ADAS.

In the UK and the EU, vehicles with ADAS, including automatic emergency braking, are becoming more common. Although these systems provide considerable societal benefits, this research, published by the *Transportation Research Interdisciplinary Perspectives* (TRIP) journal, revealed their potential impact on accident numbers across various driving contexts. Lead author Leandro Masello, Data Scientist at Motion-S and PhD

candidate at the Emerging Risk Group, UL, said that although ADAS provide considerable road safety benefits, their performance is often constrained by challenging conditions, like adverse weather. According to Mr Masello, "The driving environment affects vehicle dynamics and sensor capabilities. A system that suddenly brakes to avoid a crash will perform better in dry weather conditions than in adverse conditions like heavy rain and ice, which reduce tyre traction and can cause the vehicle to skid. Similarly, inclement weather impairs the sensors' ability to perceive the environment accurately. For example, a snowstorm could obstruct the camera vision system or cover lane boundaries."

Dr German Castignani, co-author and CEO of Motion-S S.A., said road safety reports are a fundamental source of information for the continuing development of the car industry as they help study the distribution of the accidents' environmental conditions. "They provide information about the vehicles and casualties involved and the accident circumstances (e.g., geographical, temporal and road information). Our work leverages such data to estimate the potential reductions in accidents that ADAS can mitigate", Dr Castignani added.

UL lecturer awarded prestigious design honour: Sharing insights on XoSoft and impactful design work

Bernard Hartigan, a lecturer in Product Design and Technology at UL, was awarded the ADI Compasso D'oro, one of the most prestigious and oldest institutional design recognitions in the world, for the design work he led on behalf of UL for XoSoft, a soft modular biomimetic exoskeleton to assist people with mobility impairments. The award-winning Compasso D'oro designs are permanently housed and on display within the ADI Design Museum in Milan, Italy.

Bernard kicked off Design Week at UL in November 2022 with a public talk on his work on XoSoft and more widely on his career as a designer, which includes a custom Volvo Ocean Race life jacket and the buoyancy Aero vest co-designed with five-time Olympic gold medallist Ben Ainsley's Americas Cup team, while working with Spinlock. A host of famous names have worn the Spinlock vest Bernard designed – including Catherine, Princess of Wales and climate activist Greta Thunberg. Bernard described how the lessons learned from these projects led to XoSoft and why he thinks projects he is currently working can have a significant impact on people's lives. "It's a privilege to get the opportunity to design life-changing and enabling products", he explained.

Bernard was brought onto the teaching team because of his reputation as a talented designer with over 15 years' international industry experience, during which time he developed a unique skillset in soft materials production, footwear design and production, pattern making and international apparel business models. In addition to the XoSoft project, Bernard is currently working on a PhD in the research area of product design and performing arts, which focuses on mitigating against dance injuries through the redesign of the heavy Irish dance shoe.

Bernard was awarded the Compasso d'Oro at a ceremony in Milan in June. The award is a huge honour and a significant metric for the School of Design's design-research output. Bernard had this to say when he won the award: "We are extremely delighted with this award. It is a fantastic recognition of this European multidisciplinary project that brought together groundbreaking soft actuation technology, biomechanics analysis and user-centred product design with academic partners."

According to Professor Leonard O'Sullivan of UL's Rapid Innovation Unit, "The ADI Compasso d'Oro is a very prestigious design award. This award recognises the central role Bernard had in designing this highly innovate soft exoskeleton to assist people with walking impairments. On the XoSoft project, UL led the user-centred design of the product. This award further builds on UL's reputation in design, both nationally and internationally."

UL launches programme to help translate scientific research into commercial application

Entrepreneurial action shapes economic prosperity, social equity and environmental protection and plays an important role in addressing the SDGs and environmental challenges. Entrepreneurial skills and competencies align with the range of creative, innovative, questioning and resilience skills and capabilities required by graduates and companies to navigate and succeed in a 21st-century world of volatility, uncertainty, complexity and ambiguity. As part of a suite of initiatives to expand UL's entrepreneurial support ecosystem, KBS, in partnership with UL's Technology Transfer Office

and the Nexus Innovation Centre, developed an initiative entitled 'From Research to Spin Out – The Role of Entrepreneurial and Innovative Thinking'. The programme was created in response to a growing imperative to enable scientists to translate scientific research into commercial application. It engages researchers in the research commercialisation process, demonstrating how research can be transformed into marketable products, services, processes and spinout companies. The programme will empower researchers with entrepreneurial and innovative knowledge and skillsets to explore opportunities for establishing start-ups and spinouts. By combining the insights of experienced spinout entrepreneurs, government support agencies and venture capitalists, the programme will generate an important network of supports for researchers and serve to nurture an enhanced innovative research culture across the UL campus.

Student Showcase

re-PET3D - **Emma Jude Lyons, Callum Guttridge, Alice Shannon and Niall Mulcahy**

(Shortlisted for Sustainability Challenge)

Plastic pollution is rife worldwide, and Ireland is no exception. Up to 60% of our plastic waste is being exported, incinerated or dumped in landfill, and as little as 33% of plastic packaging is recycled in Ireland. However, this waste material could be given a useful second life. That is the focus of Emma Jude Lyons, third-year PhD candidate; Callum Guttridge, third-year master's student, Alice Shannon, fourth-year PhD candidate; and Niall Mulcahy, second-year master's student, all of whom are attached to CONFIRM and the School of Design.

The team's project aims to harness plastic waste to benefit local communities. The waste material will be used locally rather than being transported or exported for recycling, which should result in fewer transport emissions as well as reduced waste. The team will collect waste plastic bottles made from PET (polyethylene terephthalate) plastic, which will be treated locally before being recycled into 3D-printed objects such as urban furniture, large-scale outdoor games for schools and art pieces.

The team's initial focus is to get the material processing up and running as part of the pilot study. "Once the bottle is clean and shredded, we can make a 3D printing filament, which can create almost anything using any regular 3D printer", they explained. "Our project targets three key UN sustainability goals – SDG 9: Industry, Innovation and Infrastructure; SDG 11: Sustainable Cities and Communities; and SDG 12: Responsible Consumption and Production. Our project positively impacts sustainability by using a local supply chain for material sourcing, processing and final product use. Since we are using plastic waste for a new product cycle, it is an economic way to reduce local waste, and we do not need to extract additional natural resources from the environment."

Giving Voice

"The scale of the challenges sustainability addresses is extremely difficult to comprehend, and the solutions can be even more difficult to visualise. However, the success of sustainability comes from its foundation in continuity, beginning with the smallest of actions, built up on top of each other, by every section of society. Small, continuous and united – that is how sustainability can succeed. UL Student Sustainability has shown me how students are the perfect cohort to demonstrate the success of small, continuous and united action."

Ríona Gillespie, Year 4 BA Politics and International Relations & Digital Culture and Communications student

Reduce inequality within and among countries.

10 REDUCED INEQUALITIES

Irish Travellers' access to justice – 'First of its kind' study undertaken by UL researchers

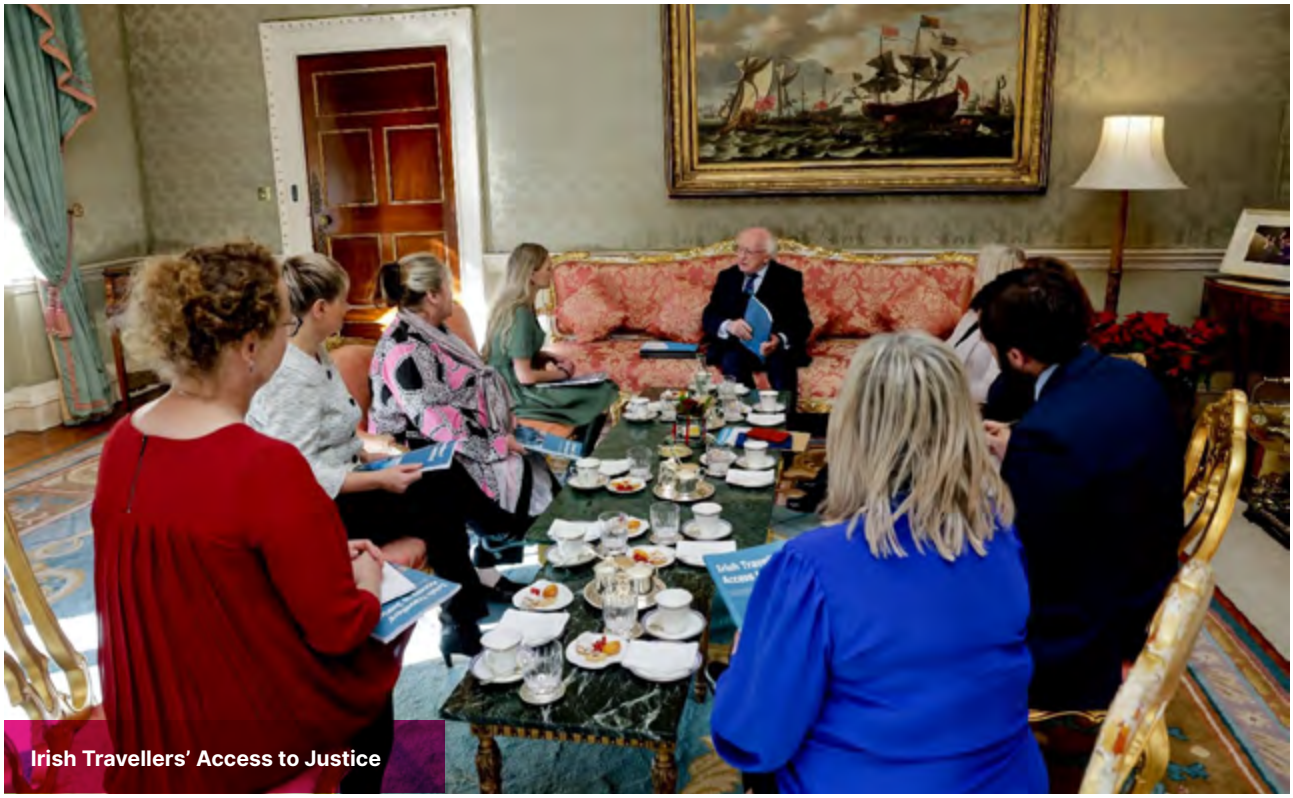
A ground-breaking new study by UL researchers examined for the first time the relationship between Travellers and the Irish criminal justice system. The Irish Travellers' Access to Justice project documented Irish Travellers' perception of, and trust in, the Irish criminal justice process, including the police and courts. The project generated original data that enables a direct comparison to be made between the opinions and experiences of Travellers and those of the general population. The study provides an evidence base for future legal and policy reform, including crucial information as to how An Garda Síochána, the courts system and the judiciary can fulfil their obligations under section 42 of the Irish Human Rights and Equality Commission Act 2014.

In some of the key findings from the research, Travellers reported hearing expressions of overt racism by gardaí and judges. Respondents also reported experiences of garda harassment, threats to abuse power, garda provocation, gardaí deliberately escalating conflict, and degrading treatment during incidents of stop and search. Almost two-thirds of Travellers who were in garda custody in the five years prior to the survey did not feel safe the last time they were in custody.

According to Dr Sindy Joyce, lecturer in Traveller Studies in the Department of Sociology, "The results of this research will come as no surprise to members of the Traveller community, whose experiences and perceptions of the criminal justice process are unequivocally linked to both their identity as a historically traditionally nomadic community and their present-day status as a racialised indigenous ethnic group in Irish society. It is of paramount importance that this research is used for the benefit of Travellers and to guide the criminal justice system in bringing out the meaningful change it shows is required."

During the course of the 18-month-long study, UL researchers surveyed 1 in 60 adults of Traveller ethnicity and conducted 29 interviews with employees of Traveller projects nationally.

The Irish Travellers' Access to Justice project is exceptional for three key reasons. First, the research embodies the principle of "nothing about us without us." It was guided from the outset by a Traveller-majority advisory committee, which included five national Traveller organisations. Both from the settled community, the PIs recruited a team of three research assistants and one postdoctoral researcher of Traveller ethnicity. They and the advisory committee were involved in every aspect of the process, from design to write-up.



Irish Travellers' Access to Justice

Second, although the research was originally envisaged as involving extensive fieldwork, the team successfully pivoted in the face of COVID-19 restrictions and completed the work remotely. Despite a digital divide and literacy gaps, the research objectives were achieved and, in some cases, exceeded through the use of an innovative combination of telephone interviewing, online data entry and remote digital recording.

Third, the findings of the research were ground-breaking, both in terms of evidencing Travellers' perceptions and experiences of the criminal justice process and the gaps between their perceptions and experiences and those of the general population – in many cases, an inverted relationship of trust and satisfaction was evidenced. For the first time, the research explored the reasons why Travellers believe they are racially profiled by the police and documented perceptions of safety in police custody.

Funded by the Irish Human Rights and Equality Commission and the IRC under the COALESCE programme, the launch of the 146-page report at UL in June 2022 was open to the public. It was streamed on social media so as many members of the Traveller community as possible could attend, and a recording is available on the project website.

The team made a commitment to participants to disseminate the findings of the research widely and to ensure that the report's recommendations were communicated to change makers. Following the launch, the research team travelled to Geneva and presented its findings to the Human Rights Committee as part of its consideration of Ireland's compliance with the International Protocol on Civil and Political Rights. In its concluding observations, the committee highlighted Travellers' experiences of the criminal justice system in one of its statements of concern, where it explicitly referenced the interactions of Travellers "with law enforcement including through racial profiling and unwarranted home searches, as well as the overrepresentation of Travellers in all parts of the penal system."

Chief Commissioner of the Irish Human Rights and Equality Committee Sinead Gibney stated in her foreword to the report, "The methodology is ethically grounded in human rights principles of participation, and the study employed researchers from the Traveller community. Therefore, it is a landmark study in both its conduct and findings. This research marks an empirical leap in delivering an authoritative analysis and evidence-based recommendations for measures to tackle the institutional racism in the criminal justice system towards Travellers."

Supporting students from Ukraine and the wider displaced community in Limerick

Throughout 2022, several initiatives were developed at UL to facilitate the integration of the growing number of displaced persons residing in the local community due to the war in Ukraine. These endeavours speak to our humanitarian mission as a designated University of Sanctuary, and they also underscore our commitment as a university to promoting the UN sustainable development agenda and, in particular, SDGs 4, 5 and 10, which seek to widen access to quality education for disadvantaged and marginalised groups in society, end inequality in society and promote peace and justice.

These initiatives included English language bridging programmes to support the entry of students from Ukraine into undergraduate and postgraduate degree programmes, ongoing academic English, intercultural supports to help students integrate into the UL community, and general and professional English training to the wider Ukrainian community at the Access campus to enhance their communication skills and employability.

Social events were held for Ukrainian families and children, including a Christmas party and a St Patrick's Day celebration in the City Campus. In addition, new internships were created at undergraduate and postgraduate levels to facilitate these initiatives, which also align with the President's Volunteer Award. Study Abroad students from the US also benefit from this as they are provided with specialised training in preparation for their internship.

Ukrainian students of English at Access Campus, Roxboro, Limerick

These initiatives are led by academic and support staff and students across UL. Staff and students who have worked on the various English language and intercultural teaching initiatives have undertaken training in trauma-informed teaching to ensure that the needs of learners from Ukraine are being appropriately addressed.

These UL-developed activities complement initiatives introduced by statutory and local community groups and educational bodies within the framework of the Limerick City and County Council Community Response Forum, which was established in March 2022 to coordinate the delivery of supports and services for incoming displaced persons from Ukraine. The forum is chaired by the PAUL Partnership, which comprises representatives from multiple public and charitable bodies in Limerick. Taking this approach means that numerous services and initiatives are delivered in a coordinated manner, thereby avoiding duplication and ensuring that gaps in service provision are addressed.

Dr Lydia Bracken addresses Special Joint Oireachtas Committee on International Surrogacy

In May 2022, Dr Lydia Bracken, Assistant Dean Equality, Diversity and Inclusion for the Faculty of AHSS, gave evidence to the Special Joint Oireachtas Committee on International Surrogacy on the particular issues faced by same-sex couples, both male and female, who enter international surrogacy arrangements and seek to achieve parental recognition.

In her submission, Dr Bracken argued that surrogacy must be subject to specific legal regulation in order to comply with best-interest principles and that law, policy and practice in the area must be shaped by children's rights and research on children's experiences. Dr Bracken made the case that regulation needs to ensure that the intending parents who care for the child from birth can both be recognised as legal parents; that the child's right to identity is safeguarded; and that the child does not experience discrimination due to the circumstances of their conception. Dr Bracken highlighted that there is a need to legislate for future surrogacy arrangements but that the law must also provide a mechanism to recognise the legal parentage of children who have already been born through surrogacy.

In addition, Dr Bracken submitted that regulation for both domestic and international surrogacy is required and that "ignoring the reality of international surrogacy by not legislating for it leaves the door open to children's rights violations." Dr Bracken called for amendments to the Children and Family Relationships Act 2015 to ensure that children's rights are upheld in a consistent manner across all legislation on assisted human reproduction.

Representatives from Irish Gay Dads also gave evidence as part of this session. The Special Committee was established to consider and make recommendations on measures to address issues arising from international surrogacy.

Dr Amanda Haynes participates in EU group on combatting hate speech and hate crime

In Brussels in December 2022, Dr Amanda Haynes, Department of Sociology and European Centre for the Study of Hate, participated in a working group of the EU High Level Group on combatting hate speech and hate crime. Coordinated by the OSCE Office for Democratic Institutions and Human Rights (ODIHR) and organised in partnership with the European Commission, the High Level Group aims to foster discussion on issues common in the fight against hate speech and hate crime and to facilitate the dissemination of good practices to address these issues. Its four focus areas are (i) hate crime recording, reporting and data collection; (ii) hate crime training and capacity building for national law enforcement; (iii) hate crime victim support (Dr Haynes's working group); and (iv) countering hate speech online.

Dr Haynes is an Associate Professor in Sociology at UL. Her research interests centre on the analysis of physical, discursive and classificatory violences and their relationship to prejudice. Her current interests centre on hate crime, policing, stigma and minority access to justice. She has been published in high-ranking journals such as New Media and Society. Her published works include the edited collections *Critical Perspectives on Hate Crime: Contributions from the Island of Ireland* (2017, Palgrave Macmillan).

Reducing inequalities through the arts and data literacy

ADD (The Arts, Data Literacy and Diversity) is an interdisciplinary research project that explores how the arts can be used to develop data literacy. The project is based on sharing songs and data in partnership with communities from different cultural backgrounds. It combines singing and statistics to explore the impact of musical sharing on how data is understood and interpreted. Given that many people are excluded from the new world of data by language, poverty, lack of education and discrimination, the project addresses UN SDG 10: Reduced Inequalities.

Along with STEM co-PI Professor Ailish Hannigan, Professor Helen Phelan was selected to receive a total investment of €4.9m under the 2022 Collaborative Alliances for Societal Challenges (COALESCE) programme. The awards fund excellent research that addresses national and European-global challenges. "It is so exciting to see music and mathematics working together to develop new evidence about how singing can foster trust and help us deal with the urgent issues of misinformation and disinformation in the contemporary world of data", Professor Phelan explained.

Led by a musician (Professor Phelan) and mathematician (Professor Hannigan) in partnership with the migrant NGO Doras, this is one of the first projects of its kind. The goal of the project is to see if the model is feasible and transferable and to influence policy around data literacy and diversity.

AHSS EDI outreach fund

The Athena Swan self-assessment process of the Faculty of Arts, Humanities and Social Sciences (AHSS) found that only 36% of staff felt recognised for their outreach activities, which indicated a greater need for visibility and celebration of socially engaged research and service. The AHSS Equality, Diversity and Inclusion (EDI) Outreach Fund was made available in 2022 to support outreach initiatives that engage with groups or communities that are currently under-represented in the work of the faculty with reference to the 13 grounds of equality/protected characteristics recognised in UL's Equality and Human Rights Strategy 2019-2022.

The following AHSS staff were awarded funding under this call:

- Catherine Jeanneau for a language and cultural awareness exploration day involving school students from DEIS primary schools
- Dr Jean Conacher and Katie McAuliffe for a project entitled 'Increasing Male Participation & Uptake in Language Studies (IMPULS)'
- Dr Fergal Quinn for a seminar and workshop on facilitating greater participation in the media by members of the Traveller community

UL researcher awarded EU Commission funding for project on combatting anti-Muslim hatred

Dr James Carr of the Department of Sociology secured funding of almost €500,000 under the EU Commission's Citizens, Equality, Rights and Values initiative (Justice and Consumers). Entitled 'Sustainable Alliances Against Anti-Muslim Hatred (SALAAM)', the project will be led by Dr Carr as PI and UL as lead coordinating partner of a consortium that includes three non-governmental community organisations – Doras, the Immigrant Council of Ireland and the Irish Network Against Racism.

SALAAM's consortium partners will work with Muslim communities and local authorities in four Irish cities in the context of the public sector equality and human rights duty and related forthcoming legislative and policy changes. Initiatives that will be developed during the life of the project include, among others, sustainable training programmes for local authority staff and Muslim communities, IT resources, supports for those who experience anti-Muslim racism, and public awareness campaigns. The project, which commenced in March 2022, will last for two years.

'Tell your own story'

The Tell your own story project (TYOS) celebrated its official launch on 14 October 2022 in the UL City Campus. In her opening speech, Dr Marie Connolly, Director of Human Rights, Equality, Diversity and Inclusion at UL, inspired a deep and critical reflection on the importance of initiatives that bring diversity and inclusion to the centre stage in the Limerick community, the west region of Ireland and nationwide: "Diversity is being invited to the party and inclusion is being ask to dance".

TYOS encourages people from diverse cultural backgrounds to 'tell their own story' in the Irish media to give readers and listeners glimpses into their cultures. The ultimate aim of TYOS is to highlight what is shared across cultures and to promote empathy and inclusivity in the wider community. The project comes from the premise that racism, stereotypes and discrimination arise due to a lack of knowledge in the community and an inflated perception of difference between cultures. Stereotypes may be based on first-hand and single experiences with members of stigmatised groups. Most importantly, however, stereotypes are driven by second-hand information, and mass media exercise great power over their audiences: prolonged exposure to biased media content can give rise to highly automatic stereotypical attitudes to other cultures.

TYOS aims to counteract this with a regular, media-based intervention to reduce stereotyping and prejudice in news media. From its inception, the project has been funded by different bodies and entities, including the IRC under the New Foundations Grants scheme, in which Doras acted as a civil partner. In addition, Narrative 4 (an Irish charity that trains schoolteachers and youth workers to facilitate evidence-based and empathy-based storytelling) collaborates with TYOS and provides training. After two training iterations, 25 participants have now been trained in interculturality, the Irish media landscape, writing for media, videoing and the creation of podcasts and radio shows.

Currently, TYOS has a regular presence in the *Limerick Voice, I Love Limerick*, Wire FM and its own podcasts productions distributed on Spotify and Apple podcast. It has been invited to contribute to the *Limerick Leader*, *Limerick Post* and Live95 and is aiming to expand its presence nationwide.

During the launch, the project team and partners, supporters, colleagues and friends gathered to celebrate the project's achievements and join forces to reach the common goal of making Limerick and the west region a more inclusive, diverse and egalitarian place.

Launch of TYOS, UL City Campus, 14 October 2022

Giving Voice

"Sustainability is of utmost importance. However, the mention of the term can often trigger panic in people. The everyday folk are disconnected from sustainability. Despite the challenges, it is essential to promote sustainable practices by connecting them with the lives of people. It's the individual who plays a vital role in achieving the goals of sustainability. Starting the conversation may be difficult, but it is one that's necessary to create a better world for ourselves and future generations."

Ciara O Flynn, Year 4 BA European Studies student

Make cities and human settlements inclusive, safe, resilient and sustainable.

11 SUSTAINABLE CITIES AND COMMUNITIES

UL accommodation offers waste separation and donation schemes to reduce landfill waste by 8%

Plassey Campus Centre (PCC) has set a goal of reducing landfill waste in residence by offering waster separation options such as composting, recycling, battery disposal and glass bottle banks. All options are easily accessible for residents, and awareness campaigns are promoted to increase usage. In addition, departing students can donate leftover, non-perishable items such as tinned goods, clothing and books.

Each village has easily accessible, communal refuse areas where each waste type can be disposed of. In addition, glass bottle banks and battery disposal boxes are located within each residence. Students can collect bin bags for each waste type free of charge from their village reception, thereby reducing costs.

Each waste bin has a sticker that identifies the type of bin and outlines in simple terms what should be placed in that bin. Before they arrive, students are informed of the different waste options via an online induction, and once they are in house, they receive information about waste disposal through various avenues, including email; residence life sustainability events; and visual graphics throughout PCC buildings, such as posters and advertising on their communal television screens.

Feedback from campus residents has been positive: "This makes it a lot easier to do recycling and composting as we would probably struggle to without it", one resident stated. "Yes, I separate my waste in residence. The campaign makes it easier to handle our rubbish and much better for the environment", explained another. As well as preparing students for a greener life post-residence, this focus on enabling residents to take agency over their sustainability experience has seen PCC's landfill tonnage decrease by 8% in 2022 compared to 2019.

Pre-departure, all residents are informed of the donation programme, which involves students simply bringing any non-perishable items to a designated drop-off point in their village for donation. Local charities, such as St Vincent de Paul, are then contacted and arrange for the items to be collected and distributed to vulnerable people in the local area. WEEE Ireland Battery Disposal and Mr Binman are also involved in the disposal of waste.

Developing thermal management solutions to sustainably transform the internet and AI

Dr Vanessa Egan is a member of the Process Engineering Cluster at the Bernal Institute and a senior lecturer in Mechanical Engineering at the School of Engineering. Funded by SFI under the CONNECT Research Centre, Dr Egan's research aims to develop thermal management solutions for 5G and future networks. The development of these networks will offer faster download speeds, more capacity and much higher connectivity for devices, which will transform the technology used for virtual reality, the internet and AI.

One of the main challenges for this network infrastructure is maintaining operating temperatures at acceptable levels. These networks require lots of physical base stations, which contain densely packed electronic components that dissipate large amounts of heat. Dr Egan's research has focused on the design of passive, two-phase heat transfer devices to provide cooling for these electronic components. The main findings from her research include design criteria for multiple component cooling and the development of a novel diagnostic tool that can underpin the optimisation of device manufacture.

SAUL to represent Ireland at the 2023 Venice Architecture Biennale

Peter Carroll, Elizabeth Hatz, Peter Cody, Mary Laheen and Joseph Mackey of the School of Architecture at UL (SAUL) have been selected to represent Ireland at Venice Architecture Biennale in May 2023. Venice Architecture Biennale is the premier showcase for contemporary architectural culture in the world, and the theme for 2023, set by curator Lesley Lokko, is 'The Laboratory of the Future'. In keeping with the subject, the SAUL proposal looks to put our islands' diverse communities, language, cultures and experiences right at the centre of the discourse surrounding our collective national future – and situated within a global community.

The theme of the proposed Irish pavilion is 'In Search of Hy-Brasil', derived from an intense engagement with the islands of Ireland. It is a direct provocation to all to reimagine the vast combined territory of land and ocean we call our home.

Geographically remote and mainly peripheral to contemporary discourse, our islands are by necessity robust, resilient and inventive places. They have long been a significant crucible for language, music and song bound up with lived experience and support a rich and unique biodiversity. Existing on the margins of viability, their small communities have embedded in their social order and cultural memory a deep knowledge and understanding of the ocean, land and resource management and the practice of maintaining sustainable environments.

We are an island nation facing an uncertain future. The challenges of climate change, renewable energy, ethical food production and biodiversity must be met quickly, with purpose, renewing the lost equilibrium between us and the natural world. In making this adjustment, our islands' inventiveness in the face of adversity and creativity in response to having less provides us with the necessary tools and narratives to inspire more sustainable ways of living. Ireland's national pavilion at Venice Architecture Biennale 2023 offers an immersive experience that shifts between the local and the territorial, the micro and the macro, to make explicit the implicit intelligence of these most remarkable of places.

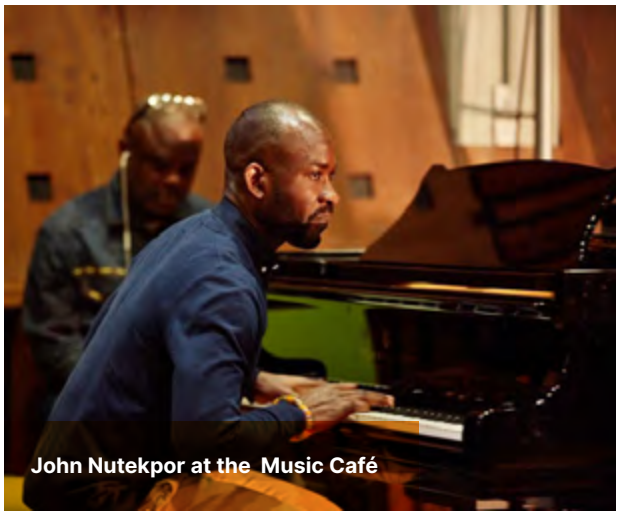
A significant projected film-scape and soundscape in the Irish language of Inis Meain, Co. Galway, filmed in autumn 2022 with Red Pepper Productions, will be the centrepiece to the installation. Other largescale pieces in the installation will include a black sheep's wool 1:100-scaled model of Skellig Michael, Co. Kerry, a large 9m x 3m linen tapestry featuring a contoured drawing of Ireland's territorial waters, several large ground-based stone tablets with the engraved geology of islands, such as Clare Island, and a host of drawn and spoken island narratives. SAUL undergraduate students will invigilate the exhibition along with peers from UCD and UCC.

The installation will go on tour in January 2024 to the island communities with which we interacted during the project. The installation is sponsored by public bodies, including UL, UCD, OPW (Office of Public Works), RIAI (Royal Institute of the Architects of Ireland), local authorities and TG4, and private bodies, including Cardinal Capital and Kent plc.

Irish World Music Café welcomes new migrants to UL City Campus

The Irish World Music Café (the 'Café') was created in 2015 in Limerick in the context of the Irish Refugee Protection Programme. The model was developed by Professor Helen Phelan in response to a request from migrant NGO Doras and co-designed by academics, musicians and community-based partners. The Café hosts music-based social gatherings, the aim of which is to create spaces of hospitality for new migrants in Ireland. Since 2019, Professor Phelan has worked closely with Professor Anne MacFarlane in integrating the café model into migrant health research initiatives through the PART-IM (Participatory and Arts-Based Methods Involving Migrants in Health Research) research cluster funded by the Health Research Institute.

The PART-IM community partner and Doras are at the coalface of the recent refugee crisis emerging from the conflict in Ukraine. In 2022, Doras identified the need for a regular, social and creative space for migrants to socialise together and with the wider Irish community. Hosted at the UL City Campus, a weekly UL City Campus Music Café was set up in 2022. The café continues to attract newcomers to Limerick from Ukraine and other parts of the world to share music and community within the context of a university-run initiative. Coordinated by musicians from the Irish World Academy of Music and Dance, the café also provides a space for Irish and international UL students to share their musical talents with the wider community.



John Nutekpor at the Music Café

UL and Silkroad forge a new cultural partnership

In September 2022, UL and Silkroad, the global musical ensemble founded by cellist and cultural ambassador Yo-Yo Ma, announced the launch of a new cultural partnership. The artistic and educational collaboration will provide UL students with the unique opportunity to create a new theatre work exploring the history, cultures and music of the immigrant communities who built the American Transcontinental Railroad. The resulting piece will be a crucial component of The American Railroad, Silkroad's multi-year concert, educational and commissioning series led by Artistic Director Rhiannon Giddens, the Grammy-award winning musician who is artist-in-residence at the Irish World Academy of Music and Dance.

The partnership officially kicked off on Thursday, September 8 at Harvard University in Boston, USA with a series of workshops exploring the stories and songs of Irish railroad workers, followed by a performance featuring artists from Silkroad and UL. "Having worked with the University of Limerick as their artist-in-residence over the last year, I've been dreaming up a collaboration between them and our artists at Silkroad for some time", explained Rhiannon Giddens. "Members of our team visited UL's campus in March – just down the street from my home in Ireland – to begin exploring the intersections of Irish traditions and Irish American music within the context of the American Railroad. It's a joy to continue that journey now in Silkroad's neck of the woods, and I can't wait to see what we create together."

An array of artistic and educational activities – including master classes, workshops, artistic retreats and performances – will broaden the newly established collaboration. These activities will gather Silkroad and UL artists in Ireland to uncover the Irish community's impact and legacy on the American railroads, focusing on musical traditions that have been widely shared and reinterpreted since the 19th century.

UL students will be invited to share in and learn from the creative process as these artists join forces to design, shape and produce a new theatre work, with music written and performed by members of the Silkroad Ensemble, as part of The American Railroad project.

The UL residencies will be based at the Irish World Academy of Music and Dance and will be facilitated and overseen by Dr Sandra Joyce, Interim Executive Dean of Arts, Humanities and Social Sciences at UL. "UL is delighted to forge this partnership with the prestigious Silkroad Ensemble, particularly through Silkroad's Artistic Director Rhiannon Giddens", said Dr Joyce. "Rhiannon's presence in Limerick, where she is raising her family, and her appointment as artist-in-residence at the Irish World Academy of Music and Dance have provided us with a unique opportunity to develop our relationship, and we are excited about the potential to collaborate going forward. Silkroad's The American Railroad is a very appropriate focus for the building of our connections. We are delighted to be in Boston and at Harvard to celebrate the partnership and to plan for the future!", concluded Dr Joyce.

UL hosts global dance medicine and science conference

In October 2022, the Irish World Academy of Music and Dance hosted the 32nd conference of the International Association of Dance Medicine and Science (IADMS). Entitled 'Exploring Intersections of Dance, Health and Research', the conference was attended by over 500 delegates.

IADMS is an inclusive global network of professionals who care for those who dance by evolving best practices in dance science, education, research and medical care to support optimal health, well-being, training and performance. The conference hosted at UL was IADMS's first hybrid event, allowing thought leaders worldwide to attend both in person and virtually. The host committee was co-chaired by Dr Orfhlaith Ní Bhriain of the Irish World Academy and Dr Róisín Cahalan of the School of Allied Health.

The highlight of the conference was a special concert featuring the Fidget Feet Aerial Dance Theatre, Limerick Youth Dance Company, Scoil Uí Ruairc, students and staff of the Irish World Academy, and award-winning ÉIRÚ. The performance by ÉIRÚ, a contemporary Irish dance company, was supported by the UL 50 programme.

Nancy Kadel, IADMS President, and Leigh Ponniah, Acting Executive Director, were both delighted that the conference was hosted at UL. At the opening of the conference, Ms Kadel said, "IADMS was thrilled to host our 32nd Annual Conference in Limerick and we cannot express our gratitude enough to the University of Limerick and the Irish World Academy of Music and Dance, as well as the Shannon Region and Fáilte Ireland tourism bureaus, who provided outstanding support for our staff, our leadership, and our attendees. At present, we have over 560 attendees, from 32 counties, registered. It is really exciting to be hosting our multidisciplinary conference at a venue that also appreciates the intersection of arts and medicine, and we look forward to sharing this common interest and the wonderful Irish culture with our international attendees."

According to Irish World Academy Director Professor Helen Phelan, "The Irish World Academy of Music and Dance was honoured and excited to be hosting this important conference. Bringing practitioners and scholars together is a core aspect of our vision. Having this incredible gathering of dancers, medical professionals, researchers and educators here is a testimony to the flourishing of dance and health research in the Academy and across the University."

Integrating the new European Bauhaus into Ireland's climate transition

In October 2022, Limerick's Citizen Innovation Lab hosted a symposium with the +CityxChange project partners, who presented infrastructural demonstrators and shared insights and lessons learned from the implementation of the project to date in Dublin and Cork – the Irish cities taking part in the '100 Climate-neutral and Smart Cities by 2030' mission. The invited audience included people from government departments, local authorities, academia and state agencies involved in delivering Ireland's climate action plan and cities mission.

At the symposium, Limerick City and County Council presented an overview of the +CityxChange demonstration projects. The projects' systematic co-creation approach, CommuntyxChange, was presented by UL, and its alignment with the New European Bauhaus policy initiative (a creative and interdisciplinary initiative that connects the European Green Deal to living spaces and experiences) was explored. Citizen Innovation Lab stories told by positive energy champions demonstrated citizen interactions with digital tools for collaboration and project impact in Limerick. During the event, the Limerick Energy Model and the Community Mapping Tool were demonstrated in the Citizens' Observatory, and there were tours of the School of Architecture at UL's Fab Lab Limerick.

Student Showcase

UL geography students awarded second place in Virtual Environmental Challenge 2022 – **Aaron McEvoy and Jack Relihan**

Second-year geography students Aaron McEvoy and Jack Relihan took part in the Virtual Environmental Challenge in April 2022. Focusing on student ideas related to climate change and sustainability on campuses, the annul competition is held between universities in France, Slovakia, Ireland and Burkina Faso. Representing UL in 2022, Aaron and Jack successfully made it to the final and ultimately finished in second place. Their project examined how new air- and temperature-monitoring equipment from the UL geography lab could be used to assess the urban heat island effect on the UL campus. 'Urban heat islands' occur when natural land cover is replaced with dense concentrations of pavement, buildings and other surfaces that absorb and retain heat. This increases energy costs, air pollution levels, and heat-related illness and mortality. Aaron and Jack's project recommended the campus community invest in green roofs to reduce this effect.

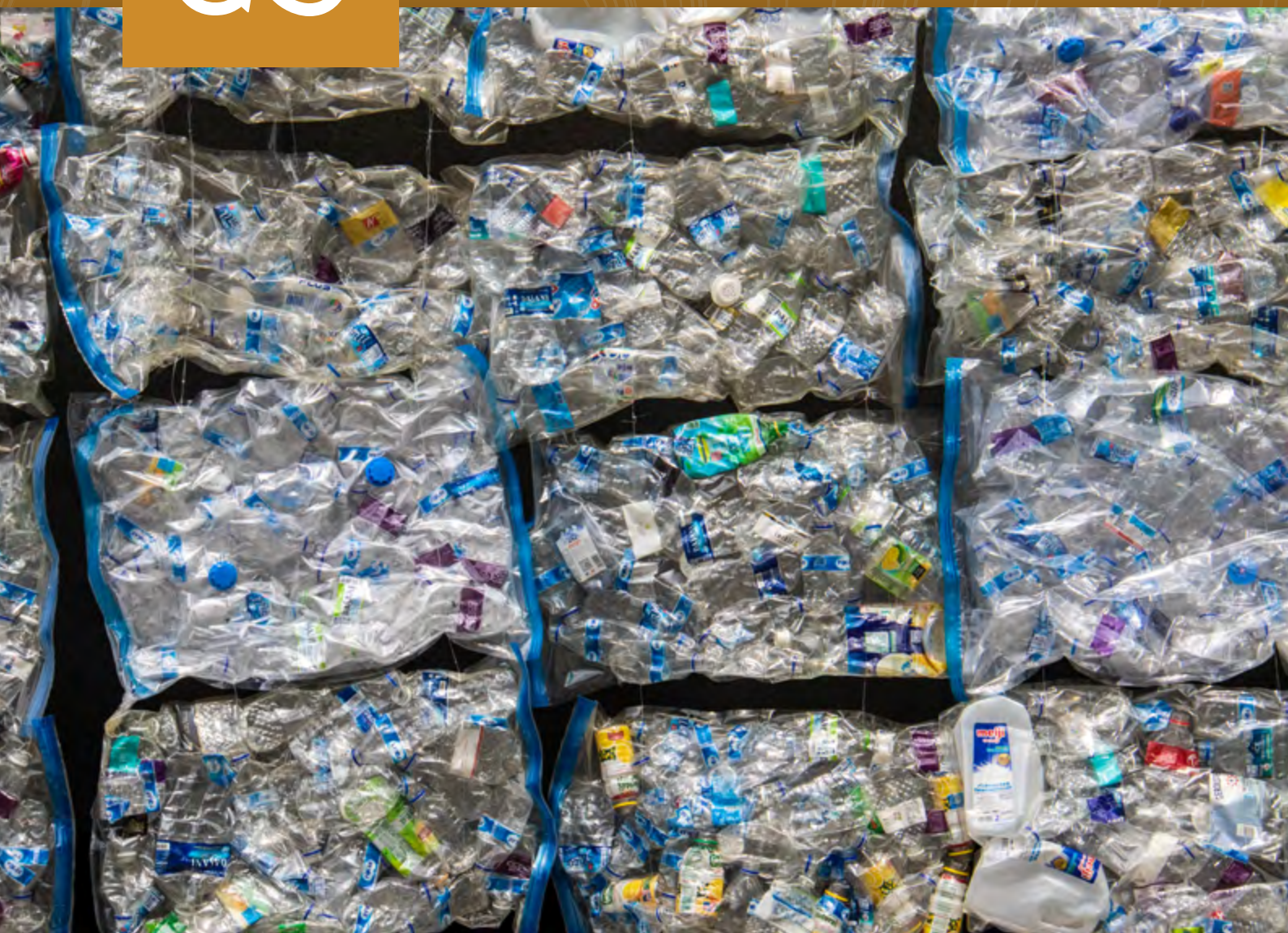
Giving Voice

"Within the Ecology group in Biological Sciences, University of Limerick, sustainability is more than a buzzword. We champion a future where green innovation, responsible practices and environmental stewardship are the core of what we do, both through teaching and research. We are united in our commitment to sustainable education, research and community engagement through our many outreach programmes in ecology and biodiversity. Together we cultivate a culture of conscious living, inspiring the change towards a more sustainable world."

Dr Audrey O'Grady, Senior Lecturer, Department of Biological Sciences

Ensure sustainable consumption and production patterns.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION



UL Library brings a makerspace to the UL campus community

Maker culture is crucial to contributing to the social, economic and environmental pillars of sustainability. With this in mind, the UL Library Makerspace opened in 2022 and forms part of the Edge at UL Library – a student-centred, flexible environment that enables creativity, collaboration and engaged learning. Open to all UL students and staff, people are invited to experiment, innovate, create, fail and start over again. The Makerspace is a neutral setting, offering in-house free access to a range of emerging technologies and tools, which, depending on course or role, may not normally be available to students or staff. The Makerspace engages users in new technologies and facilitates hands-on introductory workshops whereby UL students and staff learn how to use a 3D printer, 3D scanner, laser cutter, Cricut maker and heat press, circuits, and a selection of open-source hardware and software.

The space has facilitated multiple visits, from local DEIS schools to international tours via UL Global, and the space offers tailored workshops as part of the Access to University pre-entry undergraduate course. Alongside the static technologies, the Makerspace offers an equipment-lending service, which enables users to try out new and different technologies. The service encourages experimentation, enhances creativity, supports teaching and learning and helps develop digital skills. The technology is available to borrow freely, ensuring that all members of the UL community – and not just those who can afford to do so – have the opportunity to experiment with often-expensive equipment. The space is managed by a librarian and staffed by UL students on their co-op placement.

In November 2022, when the Makerspace had been operational for almost two months, the Library conducted the 2022 Library Satisfaction Survey. Feedback from the student and staff respondents was very positive. “Makerspace is cool, well done. More spaces like this would be nice” was one response. Another stated that “The new makerspace is a hidden GEM in the library, a service I look forward to using more in the future.”

The maker community is built on sustainability – many makerspaces foster initiatives and projects around innovative ways to reuse and recycle. This aligns with the UL Sustainability Framework 2030, which states that “By 2030, UL will have developed a maker culture across its campuses, where repair, reuse and local production is widespread”. Makerspaces play a part in transforming higher education institutions into pioneering exemplar models of sustainable development.

Converting plastic waste into sustainable materials for advanced lithium-sulphur batteries

Approximately 26 million tonnes of plastic waste are generated in Europe annually. Generating 61 kg per person per year, Ireland is the EU’s largest producer of plastic waste per capita. For decades, China had imported the bulk of the EU’s waste plastics until 2018, when a ban was imposed on their importation. Within the EU, the potential for recycling plastic waste remains largely unexploited: 30% is recycled, 31% is put into landfill and 39% is incinerated. The incineration of one tonne of polyethylene plastic in air is estimated to generate three tonnes of CO2 gas. Consequently, upwards of 30 million tonnes of CO2 are generated through the incineration of waste plastics in the EU each year. Therefore, there is an urgent need to adapt a more circular approach and develop pioneering technologies for the conversion of plastic waste into value-added, sustainable materials.

The overall aim of the COSMALIS project is to develop a state-of-the art, scalable method to remediate our excessive amounts of plastic waste into useful, value-added porous carbon materials (PCMs), which will be used as electrodes for advanced (lithium-ion and lithium-sulphur batteries. Utilising PCMs in batteries will concurrently address two of the most pressing global issues of today, plastic waste management and the development of sustainable materials for energy storage.

This project will help Ireland further establish its position as a leader in the research fields of nanostructure synthesis and energy storage. The increased focus on energy storage research in Ireland will contribute towards achieving the national objectives of becoming more reliant on renewable energy and reducing fossil-fuel emissions, as outlined in *Ireland’s Transition to a Low Carbon Energy Future 2015-2030* energy policy. The project also has the potential of creating new start-ups and intellectual property, which will stimulate and increase the competitiveness of the Irish economy.

According to Dr David McNulty, Department of Chemical Sciences and COSMALIS PI, “A traditional linear economy following the principle of ‘take, make

and waste' is not sustainable, and alternative waste-management solutions for plastics must become a top priority for EU countries, particularly for Ireland."

COSMALIS tackles issues outlined in the UN SDGs, specifically Goal 12: Responsible Consumption and Production and Goal 13: Climate Action. The conversion of waste plastics, which are currently destined for landfill or incineration, to value-added carbon materials for use in energy storage devices will actively contribute towards achieving EU and UN goals by advancing the development of sustainable materials and significantly reducing CO2 emissions from plastic waste incineration.

Replacing mineral fertilisers with recycling-derived fertilisers – opportunities for sustainable agriculture, horticulture and the circular economy

While EU regulations are still limiting the wider application of recycling-derived fertilisers, some progress was made in 2022. For the first time, struvites, ashes and related fertilisers (classified as CRC 12-14) can be CE-certified and traded across EU borders. ReNu2Farm is engaging in and encouraging the use of recycling-derived fertilisers in North-West Europe via research, demonstrations, stakeholder engagement and linking up with policymakers.

Current agriculture and horticulture are not sustainable due to the intensive application of mineral fertilisers that are mined and produced in large parts outside the EU. The current invasion of Ukraine has had a sizable impact on the markets of mineral fertilisers because Russia is a large mineral nitrogen fertiliser exporter. Future conflicts may threaten the EU's access to mineral phosphorus fertilisers, such as rock phosphate, as these are excavated in Morocco, the West Sahara and China. At the same time, EU member states are wasting valuable nutrient recourses by following the linear economy model.

Teagasc, IT Carlow and University of Limerick

The ReNu2Farm project demonstrates the safe use of fertilisers recycled from waste products to replace superphosphate and synthetic nitrogen fertilisers to strengthen the circular economy, improve overall sustainability and reduce dependencies on the volatile global fertiliser market.

"ReNu2Farm has identified the next steps we need to take to bring these circular economy fertilisers in the mainstream of agriculture", explained PI Dr Achim Schmalenberger. "We are currently awaiting the results on our new project application to bring this aspect of the circular economy to the next level. I have been very lucky to be one of the principal investigators in the ReNu2Farm project, which has advanced our knowledge on the utilisation of recycling-derived fertilisers in the North-West of Europe so profoundly."

At UL, ReNu2Farm has demonstrated the use of struvites as superphosphate replacement in the horticulture and agriculture sector. Grassland field trials were conducted with Teagasc Johnstown Castle to highlight the use of struvites in grasslands, while partners in France and Belgium demonstrated the use of recycling-derived nitrogen and phosphorus fertilisers in crops. ReNu2Farm identified several recycling-derived fertilisers that showed plant growth performances similar to synthetic or mined fertilisers that produced no negative effect on soil health. Provided that acceptance by farmers is improving and producers of successfully tested recycling-derived fertilisers are produced at increasing scales, greater adaption to the use of recycling-derived fertilisers can be anticipated. However, there are a few issues remaining on the regulatory side at national and EU level that are holding back wider applications of recycling-derived fertilisers, such as the end of waste directive or requirements by farmers to adhere to certain voluntary standards set by national food boards.

ReNu2Farm is an Interreg Europe project and has three Irish full partners in addition to partners from Germany, Belgium, the Netherlands, Luxembourg and France. Irish partners are MTU (formerly Cork IT), South East Technological University (SETU) (formerly IT Carlow) and Teagasc Johnstown Castle. Funding was secured from Interreg North-West Europe with an initial budget contribution of €2.2m from the European Regional Development Fund and a further capitalisation of over €0.67m to expand work on horticulture and related sectors.

In particular, ReNu2Farm engages with SDGs 2, 12 and 15. The key aim of the project is to contribute to the circular economy, reduce waste and improve sustainability in agriculture and horticulture.

International E-Waste Academy for Scientists 2022

The 2022 edition of the international E-Waste Academy for Scientists (EWAS) was held at UL from 27 August to 4 September 2022. Funded by the UN Industrial Development Organization, the Global Environmental Fund and Sustainable Electronics Recycling International, the aim of the week-long, multidisciplinary event was to facilitate the career development of early-career researchers and PhD students working on e-waste from around the globe. Over 16 nationalities were represented in the student cohort.

The bid to host the EWAS at UL was led by Professor Colin Fitzpatrick and Dr Yvonne Ryan and required demonstrating best practice to participants in the form of field trips, specialist masterclasses and guest lectures. Some of the highlights of the week included a visit to Confirm, the SFI Centre for Smart Manufacturing, to showcase innovative AI and circular manufacturing solutions for hazardous e-waste treatment; a field trip to Wistek, one of the world's forerunners in circular electronics remanufacture; and guest lectures on product design for environment from Logitech.

Students were facilitated by the scientific panel to compete in a WEEEkathon challenge where each student presented their area of research and collaborated in teams to propose solutions to the global e-waste problem. The winning team comprised Mehdi Golzar Ahmadi, Sofía Lara Schlezak, Nicolás Labra Cataldo, Mariana Saidón and UL PhD researcher Narjes Fallah. The team's detailed assessment of alternatives to extended producer responsibility with a focus on the involvement of the informal sector impressed the scientific panel and further highlighted the importance of international and cross-disciplinary collaborations. 'Extended producer responsibility' ensures that product manufacturers are made financially responsible for various parts of the lifecycle of their products, including take-back, recycling and final disposal.

"We developed a proposal to systematise e-waste management in Argentina", explained winning team member Mariana Saidón. "Our goal was to submit a realistic, feasible and relevant project from an environmental and social point of view. Our multidisciplinary backgrounds allowed us to think of the problem through different lenses. The competition was challenging since the other teams had done a great job, too. We hope to be able to implement our proposal soon."

Consumers in society

The Consumers in Society research cluster engages with and contributes to sustainability discourse and policy. Dr Maria Lichrou and Professor Lisa O'Malley conduct research that focuses on sustainable production and consumption (SDG 12) and sustainable cities and communities (SDG 11). Their research examines the potential of sustainable communities as spaces where alternative modes of production and consumption are modelled. Joining conversations on sustainable futures within marketing and consumer research, their work highlights the role of experimental and discursive spaces in imagining and practising a sustainable society. The prefiguration of sustainable living enables experience and moves possibility beyond rhetoric because people understand what they can see, feel and taste. This perspective contributes to an understanding of sustainability beyond either a narrow focus on individual consumer behaviour or an abstract focus on macro-level structures.

Funded research projects by the Environmental Protection Agency and CIRCULÉIRE (the national platform for circular manufacturing) examine the use and disposal of consumer electronics and the mainstreaming of the circular economy. Research on consumer electronics provides insight into consumer and business practices towards waste from electrical and electronic equipment (WEEE). Consumers tend to store devices that are no longer in use, and disposal takes place at 'critical moments' with a high 'push factor' for materials to enter complementary streams. Recommendations include increasing the convenience and visibility of recycling solutions to normalise the practice of WEEE recycling; providing repair, 'preparation for reuse' and reuse opportunities to assist consumers and businesses to make connections to appropriate treatment rather than waste avoidance through storage; and exploring incentives and penalties to facilitate mandatory handover and the direction of WEEE to appropriate recycling systems from skip hire companies, waste collectors and scrap metal facilities. Research on mainstreaming the circular economy aims to detail current approaches to circularity, review different business models, understand the role of the end user, develop a case study exemplar and extrapolate the key implications for mainstreaming circularity in the Irish context.

Student Showcase

Reducing carbon footprint - **Denver Joseph Saldanha**

Although underdiscussed, carbon footprint is a major concern for the entire planet. The AR Carbon Footprint Label project aims to develop a carbon footprint label that helps people to have a better and more dynamic experience when buying fast-moving consumer goods at a supermarket. The study is based on existing carbon footprint models from around the world and considers lessons learned from the success and failures of those models. The medium of interaction used in the project is AR (Augmented Reality), which aims to encompass the physical world with the customer's mobile phone screen and camera to work together to make the customer aware of the environmental benefits and drawbacks of the products that they buy. The goal of the project is to promote eco-friendly buying behaviour through a research-based design approach.

Spreading awareness of digital waste - **Ishan Bande**

Internet pollution contributes significantly to global greenhouse emissions and is a persistent problem that tends to be overlooked by us all. The carbon footprint of the information technology (IT) sector is like that of the aviation industry. In 2025, it is predicted that one-fifth of global electricity will be needed to power the internet alone.

To shed light on this topic, Ishan utilised social media and a website as mediums to share relevant content on digital carbon footprint and reduction tips based on standard digital practices, which will be helpful for users to reduce their digital impact on the environment. He also created a podcast mini-series, with two-minute episodes covering digital waste, the benefit of monitoring emissions and how UX designers can work towards reducing digital pollution. The podcast and more of Ishan's work can be found on his website, dreamgreen.info.

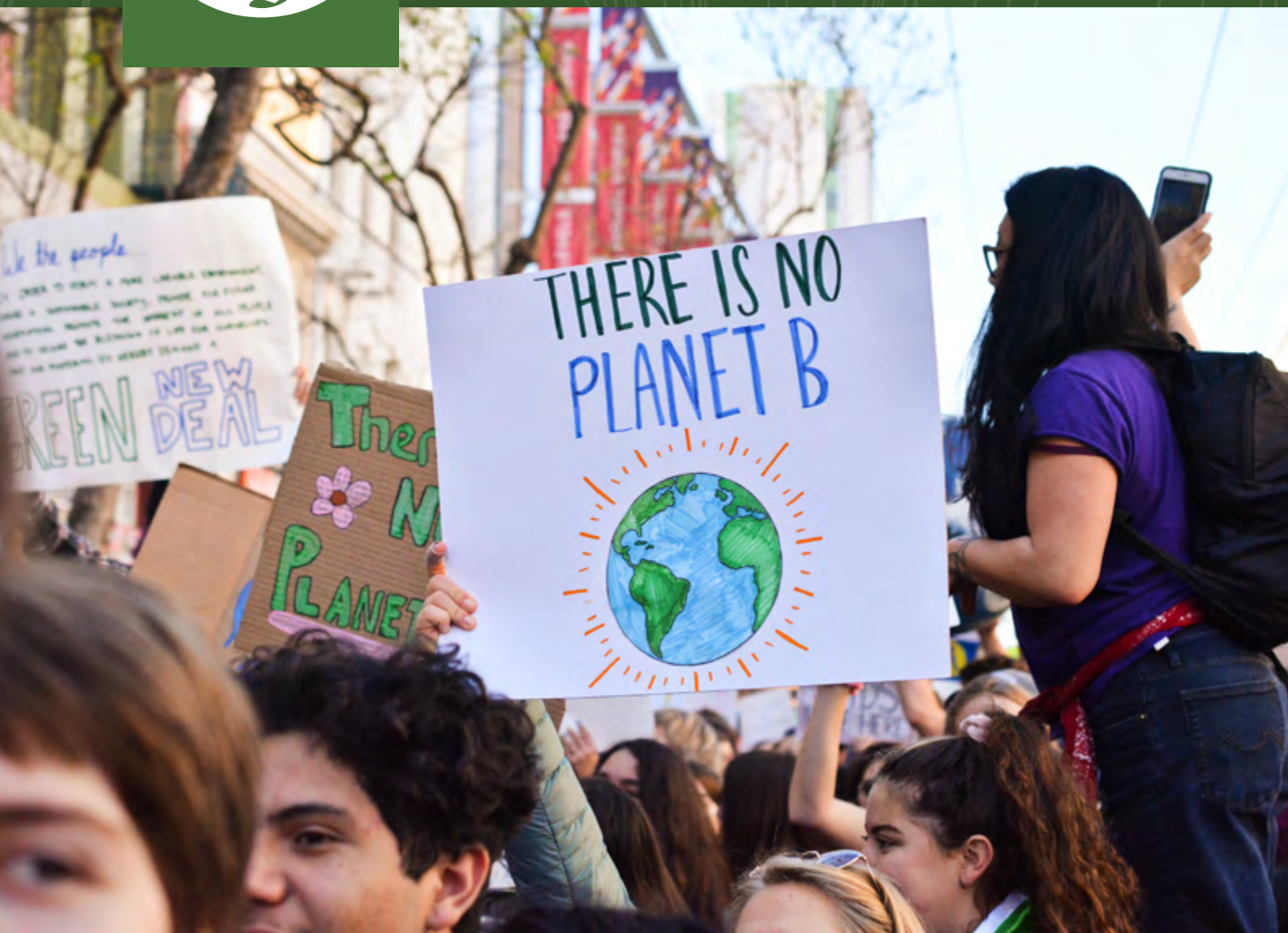
Giving Voice

"UL is well-placed to make a meaningful contribution to the creation of a more sustainable future by harnessing the expertise and ideas of the faculty and its student population. As part of a higher education institution, we have a responsibility to create, cultivate and communicate solutions to the complex problems facing our ecosystem. My role specifically will be to generate awareness of these solutions to facilitate the early adaption of new technologies and ideas, to bring hope and help to change consumer behaviour for the benefit of many."

Dermot Comerford, Technical Communication and Digital Media Officer, Faculty of Science and Engineering

Take urgent action to combat climate change and its impacts.

13 CLIMATE ACTION



Net-zero status maintained in less than 5% of scenarios modelled by UL researchers

New UL research found that ambitious net-zero greenhouse gas emission status will be difficult to achieve by 2050 and even more challenging to maintain.

Under the government's Climate Action Plan, Ireland is committed to a legally binding target of net-zero greenhouse gas emissions no later than 2050 and a reduction of 51% by 2030. These targets are a key pillar of the Programme for Government. However, scenarios modelled by researchers at UL and University of Galway show how difficult the targets will be to achieve and maintain. The research, the results of were published in the prestigious Nature Sustainability journal in November 2022, show that drastic action is needed in the agri-food and forestry sectors if Ireland is to meet its targets.

Using Ireland as a specific case study, 850 randomised scenarios were modelled, 128 of which achieved net-zero status in the agriculture, forestry and other land use sector and a further 38 of which contributed to the achievement of national net-zero status. However, extending this analysis to 2100, only 40 – or around 5% – of scenarios maintained net-zero status.

Dr Colm Duffy, Research Fellow at the School of Engineering and lead author of the paper, explained, "Successful scenarios demanded substantial cattle herd reduction, a dramatic increase in rates of afforestation and re-wetting most drained organic soils. The goal of net-zero greenhouse gas emissions for 2050 sets clear targets for measures relating to energy generation and use. However, there is a lack of clarity regarding how this is best achieved in the land use sector, which is responsible for one quarter of global greenhouse gas emissions but is also vital for our food security."

The research team, which included project coordinator Dr David Styles, Associate Professor in Agricultural Sustainability at University of Galway, adjunct senior lecturer at UL and member of UL's Bernal Institute, provides new guidance using Ireland's land use sector as a case study owing to high per-capita food output and greenhouse gas emissions. The team members say that Ireland provides a unique case study opportunity given the contrast between the expansion of a profitable and comparatively efficient agri-food sector and increasingly pressing climate targets.

The best-case scenario saw milk output sustained at 87% of 2015 levels if beef output were significantly reduced. High rates of afforestation also proved to be essential to achieve net-zero. "The agri-food sector alone cannot achieve net-zero by 2050 and must look towards offsets using new forests comprising a mix of varied coniferous and broadleaf tree species that also support biodiversity and wider amenity value", explained Dr Styles.

As the share of Ireland's land under forest cover is among the lowest in Europe, there is high potential for new planting, Dr Duffy noted. "Owing to the rotational nature of commercial forestry, carbon offsets from new forestry will weaken through time, so that only one scenario tested sustained net-zero at the national level to 2100", Dr Duffy explained.

The research team argues that higher-resolution scenario modelling is urgently needed to inform effective climate action by governments, companies and individuals. The authors note that further research is needed to examine whether future cascading use of harvested wood in the bioeconomy could sustain net-zero indefinitely across a wider range of scenarios.

FutureFarm: UL team works with Ugandan farmers on climate change solutions

A UL team received significant funding to work with farmers in Uganda to design climate change solutions. The team will work with farmers to use data to co-design solutions to climate change specific to their locations in Uganda.

Millions of farmers in Uganda lack access to information about the scope of climate-level changes they are experiencing and how they can adapt to them. Data-enabled agriculture can trigger societal changes in rural communities, which can lead to sustainable climate-smart villages being created. This project will harness data-enabled agriculture, which provides smallholder farmers access to data analytics. These insights will provide a basis for climate-based agricultural advice related to crop planning, pest and disease incidence and control, crops and livestock under unfavourable weather conditions to mitigate crop damage and loss.

While the project focuses on future systems design, the team envisages that the societal impacts will be immediate as smallholder farmers and farmer

stakeholders become empowered to imagine and design for future state climate adaptation. The scope of the impact will grow over the short and medium term as the data system develops. The focus of this SDG Challenge project – entitled FutureFarm – is to develop innovative solutions relating to challenges associated with climate, biodiversity and the environment with the specific objective of addressing challenges in countries where Irish Aid works.

From a UL perspective, the team is particularly excited by the interdisciplinary nature of the project. Bringing together expertise from Kemmy Business School and Department of Electronic and Computer Engineering in UL and geomatics and agriculture from our partners in Makerere University, Uganda, we can collectively imagine, design and, ultimately, realise data-enabled, farming futures with real-world impact.

Funded by SFI Sustainability Challenge funding in partnership with Irish Aid, the UL team is led by Dr Annmarie Ryan of Kemmy Business School and Dr Eoin O'Connell of the Faculty of Science and Engineering and CONFIRM. The UL team will collaborate with Dr Anthony Gidudu, Dean, School of the Built Environment and associate professor at the Department of Geomatics and Land Management at Makerere University, who is a co-leader on the project. FutureFarm SDG Challenge research will develop innovative solutions that contribute to SDG 13 and related goals and targets. Recognising the interconnectedness between climate, biodiversity and the environment, FutureFarm also encompasses SDG 15.

According to Dr Ryan, "This project will capacitate smallholder farmers in Uganda not only in the use of climate data to inform current farming practices but also as part of what we can term 'an imagination infrastructure' to collectively envision alternate and sustainable futures for Ugandan agriculture and its food security."

Professor Joseph O'Connor's Series *The Liffey*

A six-part television documentary series, *The Liffey*, written by Professor Joseph O'Connor aired on RTÉ in May 2022. The series highlighted the renewed engagement in creative writing with the environment and issues of sustainability and the interconnectedness of life. It featured some beautiful and unusual footage of the river along with fascinating stories from people who work on the Liffey or depend on it in other ways.

In an interview with Ryan Tubridy, Professor O'Connor was quoted as saying, "In the very literal sense, the Liffey is a life system. It supports the insects and birds and the clean air, and we wouldn't have the city of Dublin without it." Professor O'Connor joins a list of distinguished artists who have celebrated the river through their work, and this series highlights the importance of our waterways in efforts to sustain our society.

A celebrated and award-winning writer and novelist, Professor O'Connor is Frank McCourt Chair in Creative Writing and course director of the MA in Creative Writing.

Measuring methane (CH4) emissions from rewetted peatlands

Northern peatlands store large amounts of carbon. In the last century, as the peatlands were drained for conversion into agriculture, forestry and peat extraction for domestic and commercial uses, large amounts of carbon dioxide were released into the atmosphere.

As carbon dioxide is a greenhouse gas that significantly affects climate change, drained Irish peatlands are being rewetted to reduce these emissions. In accordance with the government's recently released Climate Action Plan 2023, the aim of rewetting is to increase the peatlands' carbon sequestration potential. While peatland rewetting can decrease carbon dioxide emissions, it can also increase methane emissions depending on the site-specific environmental conditions. In Ireland, 21% of the land area is classified as peat soils and, therefore, it is important to quantify methane emissions from the rewetted peatlands.

Funded by the Environmental Protection Agency, researchers from UL and Trinity College Dublin seek to measure methane fluxes from the two rewetted Irish peatlands and to quantify methane hot spot fluxes occurring from saturated and water ponded areas that have aerenchyma wetland vegetation. The field data from the project will be used to calibrate and validate models for predicting methane fluxes based on future precipitation and temperature conditions.

The project's PIs are Dr Amey S. Tilak, mentored by Professor Dr Ken Byrne (Department of Biological Sciences) in collaboration with Dr Matthew Saunders (Trinity College Dublin). The project team is working in collaboration with Bord na Móna and the National Parks and Wildlife Service.

The project leaders expressed excitement upon embarking on the journey of quantifying methane fluxes from rewetted areas and quantifying the dominant methane pathways from peat to the atmosphere using field-measured data and process-based models. Dr Amey expanded on this, saying "The process-based models will improve our understanding of the responses of the rewetted peatland and its biogeochemistry in current and future climate change scenarios."

The project relates to SDG 13: Climate Action, SDG 14: Life Below Water and SDG 15: Life on Land.

Developing 'next generation' hydrogen storage for lighter and faster vehicles

UL postdoctoral researcher Dr Shahrzad Daghighi is developing lightweight square pressure vessels with increased packing efficiency for hydrogen-fuelled car engines of the future.

Pressure vessels are widely used for storing liquids and gases for transportation. Recent strategies in the transition to hydrogen as a primary power source, together with moving to a zero-carbon economy by 2050, have led to a renewed interest in designing pressure vessels. Hydrogen can be produced with near-zero greenhouse gas emissions, but storing hydrogen is a challenge because it requires high pressures, low temperatures or chemical processes to be stored compactly.

Dr Daghighi addresses this challenge by using advanced manufacturing technologies to make bend-free composite pressure vessels for next generation hydrogen storage, which will result in lighter vehicles that can travel further on less fuel. Dr Daghighi holds a bachelor's degree in mechanical engineering with a specialism in solid design, a master's in automotive engineering and a PhD in composite structures, the thesis for which proposes a novel design methodology that exploits variable angle tow technique to suppress bending stresses in non-circular shell structures. She is a postdoctoral researcher with Professor Paul Weaver's Composites research group at the Bernal Institute and School of Engineering.

Making wind energy production even greener: recyclable wind turbines

Harnessing wind as a source of renewable energy has become more prevalent with the global shift towards decarbonisation and sustainable energy production. While the use of wind energy can reduce carbon emissions released from energy generation, the impact of wind turbine production must also be considered. Currently, wind turbine blades are commonly manufactured with a non-recyclable, oil-derived material and also using a significant number of plastic consumables and energy. To increase the sustainability of renewable energy production, further research is required to ensure that the impact of the production methods themselves are low.

The challenge of sustainable wind turbine blade manufacturing is being addressed at the School of Engineering by a team including PhD student Emma Tobin, Dr Ronan O'Higgins, Professor Maurice Collins and Professor Paul Weaver. Funded by various sources, including SFI, the project involves using advanced manufacturing technologies combined with emerging bio-based materials that industry does not currently use. The appropriate combination of manufacturing techniques and materials will introduce the potential to develop large, recyclable wind turbine blades that require less energy and cost to produce.

Database of metal contaminants in earthworm populations will prove key to a healthy Irish ecosystem

The rehabilitation of industrial residue sites and mine tailings in Ireland represents an important environmental challenge. The development of a healthy ecosystem is reliant on multiple waste management strategies.

Dr Chiara Alessia De Benedictis, postdoctoral researcher at the Department of Biological Sciences and Bernal Institute, seeks to assess metal exposure, bioavailability, potential transfer and toxicity for key metal contaminants (As, Cd, Cr, Hg, Pb and Zn) in exposed earthworms. Earthworm populations are recognised bioindicators of soil quality and health and can be used to identify specific biomarkers that correlate with metal exposure and toxicity.

Dr De Benedictis is creating a database of ecotoxicological studies carried out with earthworms to assess the potential toxicity of metals associated

with Pb/Zn mining. In collaboration with Dr Kieran McGourty and Dr Andreas Grabrucker, she will make an in vitro metals toxicity model using 2D (cell lines) and 3D (intestinal organoids derived from stem cells) to mimic critical threshold values of metal concentrations and their toxic effects.

The results generated from the project will provide in-depth knowledge of soil pollution at industrial residue sites and mine tailings in Ireland. The project is supervised by Dr Ronan Courtney, Dr De Benedictis's mentor, and funded by SFI.

UL lecturer receives funding for project on political parties and climate change

Dr Conor Little, lecturer in the Department of Politics and Public Administration, was awarded funding as a partner on a project entitled 'Political Parties and Climate Change: Positions, Polarisation and Policy Relevance (PARTYCLIM)'. The PI is Dr Fay Farstad of the CICERO Centre for Climate Research, Oslo. Involving partners from the University of York, University of California Santa Barbara, University of Tasmania and CICERO, the project aims to address the lack of systematic and comparative data on political parties' climate change positions and to provide a comprehensive analysis of the role of political parties in climate politics.

Limerick City and County Council and UL collaborate on climate change project

Limerick City and County Council and UL announced five creative community partnerships that will work on a summer-long project to explore climate change. The Decarbonising Together project will focus on learning and doing together and will use Limerick's Citizen Innovation Lab in Sarsfield Street as a collaboration hub. This new space for observing, co-creating and experimenting places citizen participation and creativity at the heart of Limerick's mission to decarbonise by 2050.

Funded by Creative Ireland in partnership with the Department of the Environment, Climate and Communications through the Creative Climate Action Fund, Decarbonising Together is one of only 15 projects around the country to be awarded funding in 2022. The Creative Climate Action Fund promotes a creative approach to illustrating the issues and making the urgent changes needed to address climate change. Limerick Civic Trust is just one of the community organisations taking part and hopes the project will be a catalyst for climate action across the organisation. According to Maeve Stone of Cracking Light Productions, which will collaborate with Limerick Civic Trust on the project, "We talk a lot about system change and acting locally; this project celebrates the potential for Limerick Civic Trust to become a pioneer in seeding environmental system change, working in and with local communities. It's all about the people that will keep the heart of the city ticking into the future."

Garryowen is another city community determined to take action when it comes to climate. According to John Buttery, Garryowen Community Development Partnership Manager, "Garryowen CDP is excited to gather climate-related ideas and solutions by working with artists to have a 'community conversation'. We want to co-create a sustainable community to ease the burden of climate change-related issues for our residents."

Giving Voice

"The future is uncertain, and in this context of climate change, it can be even more frightening. But we mustn't forget that if we want things to change, we can do something about it. There is always room for improvement, and we can act all together!"

Enola Bouvenot, BSc Food Science and Health (Erasmus) student

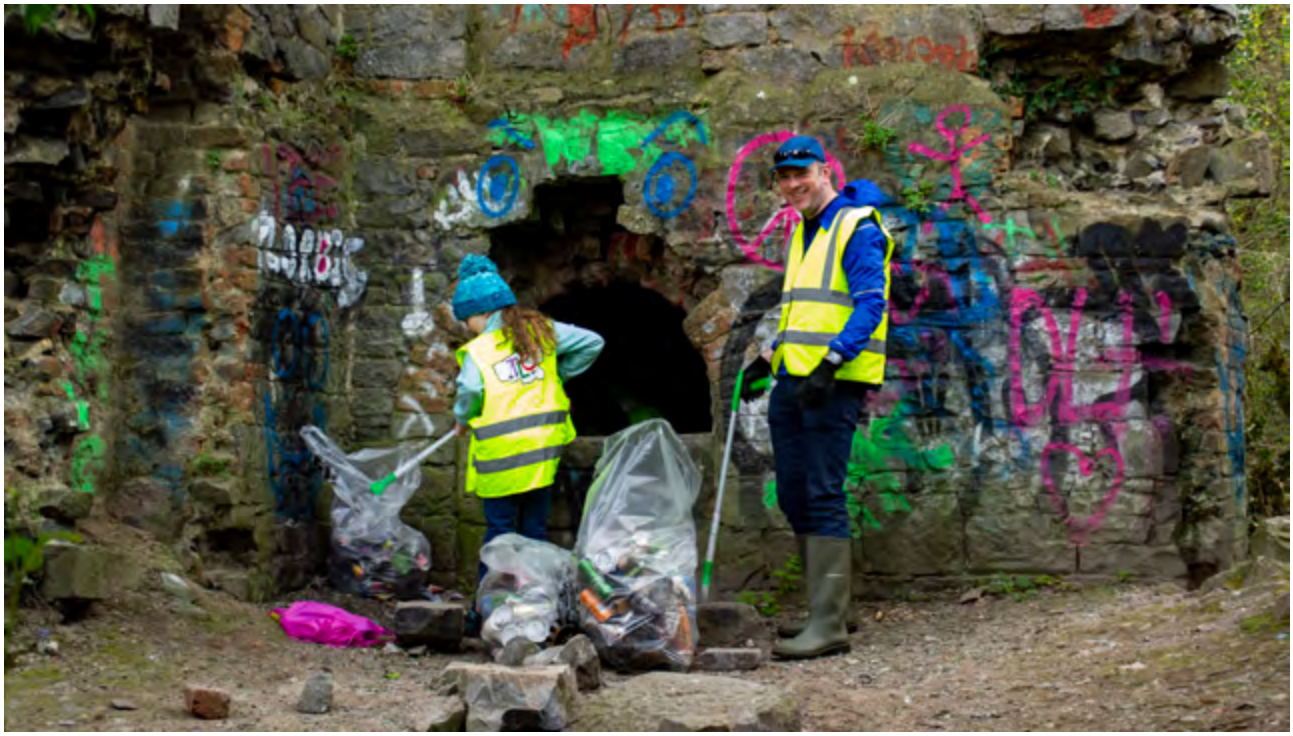
Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

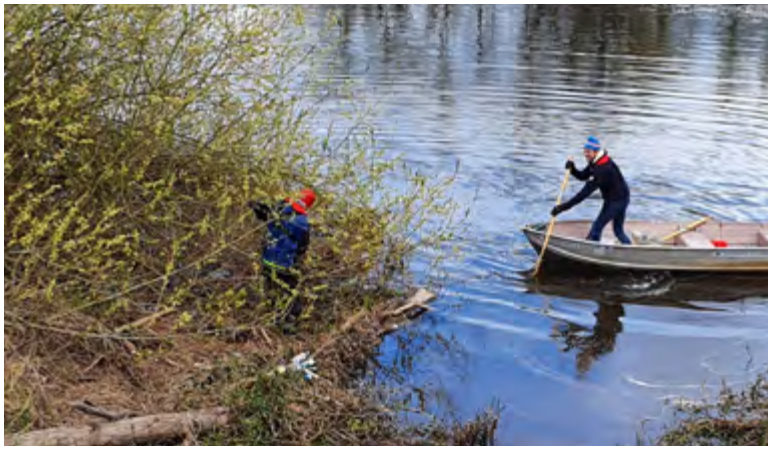
14 LIFE BELOW WATER

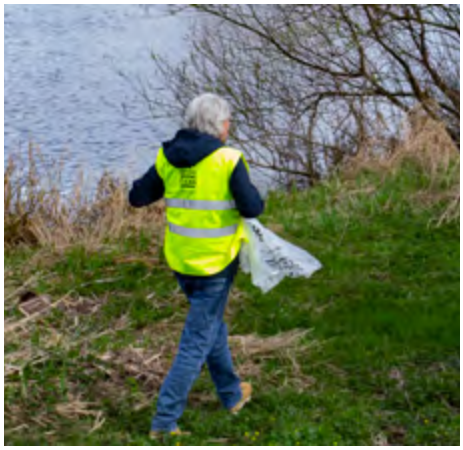
Annual UL Riverbank Cleanup 2022

The UL Riverbank Cleanup took place on 2 April 2022. An annual event since 2011, every year sees teams of volunteers collect around one tonne of litter and rubbish from the banks of the River Shannon, which flows directly through the heart of the UL campus. Approximately 60 volunteers from many UL and local groups participated in the 2022 event, and volunteer leaders very successfully led teams to tackle problem litter black spots. The Cleanup is a campus and community-wide initiative to address the problem of floating litter on campus and sees staff, students and the wider Limerick community coming together to collectively maintain the River Shannon.

Groups that participated on the day included UL Environmental Committee & UL Green-Campus Committee, UL Kayaking Club, UL Rowing Club, J&J Vision Care Ireland, Limerick Kayaking Academy and Limerick Riverpath Volunteers. Equipment and support were provided on the day by UL's Buildings and Estates and Rowing Club, National Spring Clean (An Taisce) and Limerick City and County Council.







Centre for Robotics & Intelligent Systems at UL collaborates on RESURGAM project

The Centre for Robotics & Intelligent Systems (CRIS) at UL is one of many partners involved in the RESURGAM project. RESURGAM combines friction stir welding – a high-integrity, low-distortion, environmentally benign welding technique – with new tool material to facilitate the modular construction of ships across multiple yards with final assembly at one master yard and the development of the process of underwater, robotic friction stir welding to enable repairs to be carried out on marine structures. Backed by the secure, digital Industry 4.0 infrastructure and techniques already in widespread use in the automotive and aerospace industries, these fabrication and repair capabilities will facilitate the rapid, coordinated but distributed modular manufacture of ships and watercraft throughout Europe. From a practical perspective, this will enable ships damaged anywhere in the world to be repaired in situ without having to travel to the nearest dry dock. All of this will be implemented by the European shipyards and naval architects in Europe.

As part of the project, the UL CRIS team demonstrated underwater cleaning and inspection of a steel plate (a simulation of a damaged ship hull) at Portroe Quarry, Co. Tipperary in July 2022. The task included using high-pressure water jetting and brushing and precision scanning of the damaged area with high-resolution laser scanning and optical imaging (machine vision camera). 3D models of the damaged area were generated with different methods. The demonstration was supported by mini-ROV and M300 drones.

MaREI symposium celebrates achievements and grows collaborations

Two UL researchers contributed to the MaREI symposium entitled 'Celebrating our achievements and growing our collaborations', which was held in Galway in May 2022. The huge challenges faced by society today (such as climate change) impact on many sectors. Therefore, for solutions to be found, transdisciplinary teams from many disciplines need to work collaboratively on specific goals.

Luke Fitzgerard from the Centre for Robotics & Intelligent Systems (CRIS) showcased his research, which focuses on advancements in offshore marine renewable energy installations. Such advancements bring significant challenges in terms of inspection and intervention for maintenance when compared to onshore equivalents, which are much easier to access. Similar challenges are faced in the area of specialist inspection and repair for ships, where small- and medium-sized shipyards cannot conduct the scale of repairs that would require the space of a dry dock (as described in the previous story). Due to the remoteness of offshore sites and, equally, to the fact that ships can be anywhere at sea when in need of repair, such operations can be costly in terms of the equipment, expertise and environment required, which means that improving the efficiency of these tasks is of the utmost importance.

This work involves applying real-time vision systems while taking into account both laser and camera data streams and producing high-resolution 3D models of the area(s) of interest. More specifically, in the area of damaged ship hulls, this inspection procedure will influence the friction stir welding process, a technique that will unlock many more locations for ship repair than are currently feasible. Vision research such as this can generally be transferable to other applications; in this case, any offshore underwater infrastructure can be inspected similarly. Allowing the processing of data in real-time is of great benefit in such costly missions, where post-processing is generally required, and this can speed up the overall process from inspection to repair.

Shashank Rao, a full-time UL PhD student, is conducting research that involves developing a software-defined radio platform for inter-device communication in offshore marine research and renewable energy applications. The research focuses on wireless technologies that transfer data from shore to offshore installations and within the installation itself. The final implementation proposed is a remotely managed software-defined radio-based network to control and monitor offshore energy installations such as wind or wave farms. The software-defined radio platform facilitates flexible network design (such as adding new sensors and actuators without modifying the underlying network) over the widely used Ethernet-based network. Although wireless systems have significant advantages, they have reliability, bandwidth, latency and security issues. As part of the research, aspects such as network topologies, protocols, antennas, modulation schemes, access point placement and modes will be studied, simulated and tested for maximum network throughput.

Student Showcase

Sustainable Shores: Ireland's Life Below Water – **Éabha Hughes**

(Shortlisted for Sustainability Challenge)

Faculty of Education and Health Sciences PhD applicant Éabha Hughes has developed an exciting project to tackle UN SDG 14. Entitled 'Sustainable Shores', Éabha's project focuses on providing education to local communities to help them understand how they can reduce and prevent damage to marine and aquatic ecosystems – and how the ecosystems might be sustainably restored to their natural state.

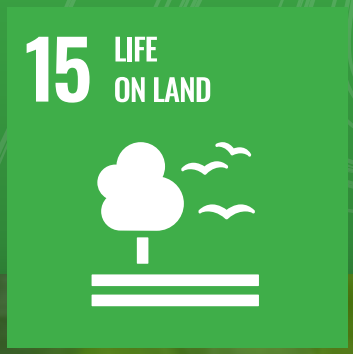
Éabha hopes to use her project's funding to produce an educational book, a website with downloadable resources, and workshops for use at UL and second-level schools nationwide to build awareness, promote citizen science and get people engaged in climate action. "Sustainable Shores targets SDG14 – protecting, conserving and restoring life below water", explained Éabha. "Through education and action, I hope this project will raise awareness and create a community of people equipped with the skills and knowledge to tackle Goal 14. Dissemination and community engagement will be crucial; I hope to publish my book *Sustainable Shores: Ireland's Life Below Water* covering ecology, biodiversity, sustainability and Goal 14 in Ireland, supported by the SustainableShores.ie website. I'll also conduct ecological assessments across the university's freshwater habitats, monitoring species and identifying threats to their survival, complemented by reviewing and realigning university policy with sustainable, regenerative action."

Giving Voice

"Education and research hold the key to unlocking a sustainable future and as a university, we play the pivotal role in educating the future Irish workforce. As such, we have a responsibility to cultivate a generation of thinkers and problem-solvers who understand the urgent need for sustainable practices. Ireland and, in particular, the Shannon region lie on the cusp of a large investment in offshore renewable energy off our coast, and key to the success of this investment and key to reaching our carbon targets is a talent pipeline for this industry. I see UL as being able to provide a critical role and being able to pave the path towards a brighter and more resilient tomorrow."

Dr Gerard Dooly, Co-Director, CRIS (Centre for Robotics & Intelligent Systems) and Lecturer in Digital Engineering, Department of Electronic and Computer Engineering

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.



UL students create a vision for a 'circular food economy'

Alongside counterparts from France and Finland, Kemmy Business School students came together in July 2022 to imagine what a circular food economy might look like for Limerick in the future. The students worked on their proposals as part of the Digital Futures Lab, a futures and foresight research and innovation programme designed to imagine market futures in which technology can act as a driver of positive change. The unique programme combines advances in futures and foresight with market shaping and has developed tools and frameworks to enable participants, stakeholders and industry partners to develop visioning practices to reimagine and shape Limerick's innovation ecosystem.

Proposals included a City Farm Lab to enable members of the Limerick public to experience an immersive education in living a sustainable life; a Smart Farm using AI technology to create a circular economy; a singular waste company to serve the region; and visions for a local Food Lab where experimenting and sharing ideas about food could drive the Limerick public to grow their own food and drive change.

"In 2022, the lab focused on visioning a circular food economy for Limerick, working across several scales, including university campus, metropolitan area and region", explained Dr Annmarie Ryan, senior lecturer in marketing at KBS and founder of the Digital Futures Lab. "Teams engaged with stakeholders and industry partners to map current systems, envision possible futures using scenario processes and design market including roles, relationships and devices required to realise these visions. We see this lab as an important engine in the driver of innovation in the Limerick region", added Dr Ryan.

The lab expanded this year to include students taking part in EULab, an Erasmus+ funded strategic partnership piloting European mission-led virtual exchange. This included students from Oulu University Business School in Finland and Audencia Business School in France, both of which are partners on the programme.

Guests in attendance at the hybrid lab included Limerick City Councillor Olivia O'Sullivan. Dr Ryan said that Cllr O'Sullivan "gave great feedback to teams regarding the innovative ideas on show from the students".

Innovative project to transform land use for net-zero emissions in Ireland

Dr John Garvey of KBS's Department of Accounting & Finance is PI on a project investigating new financial arrangements that are intended to incentivise land use change on the island of Ireland. Achieving net-zero greenhouse gas emissions from the AFOLU (agriculture, forestry and other land use) sector by 2050 will be immensely challenging. A set of indicative, stylised land use change scenarios for AFOLU suggests that there is almost certainly no pathway to net-zero greenhouse gas emissions that does not involve all of the following actions: effective abatement of livestock emissions (circa 30% emissions decoupling) plus ruminant livestock number reduction (up to 30% considered), ambitious organic soil rewetting (up to 90% of drained organic soils considered), and large areas of afforestation (up to 875,000 hectares of new forest by 2050 considered).

Led by Dr Garvey, the FINIFOR project examines the structure of environmental impact bonds to nudge Irish landowners from intensively managed grasslands towards afforestation. Aspects of behavioural economics are drawn upon to further understand how new financial arrangements should be framed to accelerate AFOLU transition. FINIFOR is funded by the Department of the Taoiseach through the Shared Island Initiative. Collaborators include Queen's University Belfast, Newcastle University and John Hopkin's University as well as industry participants from farmer representative organisations (ICMSA, Republic of Ireland; UFU, Northern Ireland) and financial institutions (Swiss Re, European Investment Bank).

Government announces €1.5 million grant awards for soil-related research

Funding of €1.5 million will be allocated to the six research projects with Irish involvement that have been successful in the first European Joint Programme call. Funding will go to four Irish research organisations: University College Dublin, University of Limerick, National University of Ireland Maynooth and Teagasc. The institutions will collaborate with research organisations from 12 European and 10 non-European countries to explore ways of enhancing the contribution of agricultural soils to climate change. Under PIs Professor J.J. Leahy and Professor Michael Hayes, the UL project is entitled 'Soil management effects on soil organic matter properties and carbon sequestration'. See the next story for details.

Speaking at the announcement of the awards, Minister of State at the Department of Agriculture, Food and the Marine Martin Heydon stated, "Soil is the foundation of everything we do in agriculture. Food Vision 2030 highlights that soil is critical in terms of agricultural output, producing healthy food, sequestering carbon, and supporting habitats and biodiversity. The research we are funding will be highly relevant to Ireland, covering areas such as carbon sequestration, soil health and the role of soils in mitigating emissions of greenhouse gases. I want to commend the researchers involved for their success in these competitive research calls and for their contribution to an innovative and resilient agri-food sector."

Project on soil organic matter properties and carbon sequestration

Professor J.J. Leahy and Professor Michael Hayes from the Faculty of Science and Engineering are collaborating with scientists from across Europe and the USA on the SOMPACS (soil organic matter properties and carbon sequestration) project. SOMPACS is a project recommended by European Joint Programme (EJP) SOIL for funding under the first EJP SOIL external call.

Having a better understanding of the persistence of soil organic carbon in top- and subsoil and identifying management practices that contribute to minimising greenhouse gas emissions will open researchers to the possibility of increasing the stable soil organic matter pools and, consequently, improving the potential of carbon sequestration. Understanding the impact of soil management on sustainable agricultural production and the environment and, in particular, on climate change mitigation should be widely promoted and put into practice.

Unearthing Ireland's carbon guardians

In a world where the climate crisis looms large, a group of scientific pioneers at UL took up the mantle of guardianship for the green heartlands of Ireland. With the urgency of climate action guiding their path, Professor Ken Byrne and his research team are embarking on a remarkable journey of discovery, venturing deep into the lush embrace of forests and peatlands to unlock the secrets of sustainability.

'Roots of Resilience' is a narrative that weaves together science, hope and action. It is a tale of scientists donning the role of environmental stewards, unlocking the Earth's secrets for a brighter, sustainable future.

And in the winds that rustle through the forests of Ireland, their story whispers, reminding us that the quest for sustainability is a journey we all share.

Despite decades of climate change research, many questions remain unanswered, such as how land use impacts carbon emissions and carbon uptake. Over the next four years, UL will collaborate on research to broaden our understanding of the forest carbon balance in Ireland. According to Professor Byrne, "Sustainable land use is critical to climate action and life on land. My research group studies greenhouse gas balances and carbon sequestration in forest and peatland ecosystems. This contributes to understanding the role of land use in greenhouse gas emissions and in the development of climate goals. A key future challenge for land use is to balance the multiple social, economic and environmental roles of the sector while achieving climate neutrality." Professor Byrne provided details on the project's methodology and aims: "For the purposes of this research project, we are using drones, sensors, aerial photography and satellite imagery as well as traditional field techniques to investigate the carbon balance in a range of forest ecosystems. Our work will improve our understanding of the carbon balance in Irish forests. It will enable the development of new methods to assess the carbon balance of all our forests across time and space. This will improve the national greenhouse gas inventory and inform national policy on climate action and land use."

Giving Voice

"Engaging students in sustainability initiatives is crucial for campus transformation. By involving and educating students, we empower them to become agents of change. Bodies like UL Student Sustainability, which are student led, have engaged with students on a meaningful level through workshops, guest speakers and brainstorming sessions. Going forward, creating inclusive spaces and emphasising the connection between personal actions and global impact will cultivate a generation of sustainability leaders, shaping a greener and more responsible campus community."

Katie McNicholas, Year 4 BA International Business student

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Shaping palliative care policy using a human-rights-based approach

Colleagues from the School of Law and the School of Nursing came together to collaborate with the All-Ireland Institute of Hospice and Palliative Care and with nursing homes and hospitals to examine palliative care services from the perspective of rights holders (residents, families and staff).

Dr John Lombard (School of Law) and Dr Owen Doody (Department of Nursing), along with Bláithín O'Shea, Research Assistant and PhD candidate at the School of Law, co-authored a report entitled 'Shaping Palliative Care Policy Using a Human Rights Based Approach', which was funded by the Irish Human Rights and Equality Commission. Published in May 2022, the research was completed in conjunction with the All-Ireland Institute of Hospice and Palliative Care, and consortium members included Nursing Homes Ireland, Health Service Executive, Tallaght University Hospital, St Vincent's University Hospital and the Decision Support Service.

The premise of the study was to give a voice to nursing home residents and their families and staff in relation to their experience and expectations of care during the COVID-19 pandemic and to influence policy to be informed by the needs and perspectives of the rights holder. This was achieved by analysing standards and policies relating to COVID-19 for public and private nursing homes from a human rights perspective and by using a targeted public survey to seek the perspectives of people living in nursing homes, their families and staff in relation to palliative care and COVID-19.

The study recommended that respect for human rights should inform and shape the development of national public health guidance and policy and that national public health advisory groups should include persons with expertise in human rights and equality.

Illicit Networks Workshop hosted by School of Law

The Research Evidence into Policy Programmes and Practice Project (REPPP) team in the School of Law hosted a very successful Illicit Networks Workshop in June 2022. The workshop brought together the world's leading academics involved in examining and analysing illicit networking. The prestigious lineup of keynote speakers included Professor Dr Edward Kleemans (Vrije Universiteit Amsterdam, the Netherlands), Dr David C. Pyrooz (University of Colorado Boulder, USA) and Professor Maura Conway (Dublin City University).

The workshop brought together those interested in understanding illicit networks (including for organised crime, terrorism, cybercrime, trafficking and environmental crime) and social network analysis. The goal of the workshop was to maximise meaningful and ongoing knowledge exchange among researchers, policymakers and those involved in policy, programme and practical engagement with illicit networks.

New qualification at UL for those who help vulnerable people when giving evidence in the justice system

In May 2022, Minister for Justice Helen McEntee announced the launch of a new qualification programme at UL. The programme will train intermediaries – individuals who help vulnerable people, including sexual abuse victims and children, when giving evidence in the justice system.

This marks a milestone in delivering on *Supporting a Victim's Journey*, the implementation plan for the O'Malley Review, which made recommendations around making available a panel of registered, qualified intermediaries to work with vulnerable victims in sexual assault cases. Intermediaries are professionals, usually with a background in speech and language therapy or a cognate discipline, with the skills and expertise necessary to assist witnesses who have communication difficulties in providing evidence.

The Professional Diploma in Intermediary Studies is a part-time course run over one year. It is a postgraduate training programme that will qualify CORU-registered health and social care practitioners to work as registered intermediaries in the Irish justice system. On successful completion of the programme, graduates will be eligible to be placed on a panel to work within the Irish justice system. The registered intermediary's role will be to assist in the communication process, whether between lawyers and witnesses during trial or, earlier, during Garda interviews.

On launching the programme, Minister McEntee said, "I'm delighted that my department has been able to collaborate with UL to provide a suitable course to train intermediaries to the required standard. Once

qualified, they will have an essential role in assessing the communication needs of vulnerable witnesses and to advise An Garda Síochána, advocates and the court on the steps needed to assist such witnesses to give their best evidence."

The project team that designed the programme includes Dr Alan Cusack and Professor Seán Redmond from the School of Law and Dr Aoife Gallagher and Dr Áine Kearns from the School of Allied Health.

IRC project examines how policymakers allocate attention to policy issues, north and south

Public Policy Agendas on a Shared Island (PPASI) is an IRC-funded project that is generating new knowledge about policymaking and the allocation of attention ('agenda-setting') to better understand how policy agendas on the islad of Ireland have developed over time and how they relate to one another.

Embedded in the international Comparative Agendas Project network, PPASI is systematically examining the development of the agendas of the shared institutions of the Good Friday Agreement and legislatures and political parties in Ireland and Northern Ireland. The study aims to provide data that can inform our understanding of politics and policymaking, including on SDG-related policy issues.

The PPASI project is ongoing, but the broader project of which it is a part (the Irish Policy Agendas Project) has already generated significant data and new knowledge about the legislative agenda and the party-political agenda in Ireland.

PPASI is led by Dr Conor Little, lecturer in the Department of Politics and Public Administration. Partners in the project include academics from Ireland, Edinburgh and Aarhus, Denmark and staff at the Oireachtas Library and Research Service. The project was awarded funding by the IRC under the Shared Island strand of the New Foundations 2022 scheme, which is supported by the Department of the Taoiseach's Shared Island Initiative.

New Foundations funding for landmark crisis intervention pilot study

In January 2022, Minister for Further and Higher Education, Research, Innovation and Science Simon Harris announced IRC funding for 77 New Foundations projects. The New Foundations programme brings researchers and community organisations together to collaborate on projects that will have a tangible impact on societal issues. In his dual role as researcher with UL and the implementation team leader of the Co-responder Crisis Intervention Team pilot project in the Limerick Garda Division and with Dr Alan Cusack of the School of Law as his research partner, Superintendent Andrew Lacey successfully applied for award funding under the New Foundations programme. To date, the project has forged strong collaborations with HSE Mid-West; PSNI; Police Scotland; Boston Police Department; Framingham Police, Boston; Toronto Police Service; Worcester State University, Massachusetts; and individual academic experts who will contribute to delivering a co-response initiative of the highest standard possible.

The proposal centres on hosting a roundtable discussion/symposium with international collaborators led by international experts and practitioners in the field of crisis intervention. One of the aims of the project is to provide participants with an opportunity to exchange experiential information with respect to best practice approaches to addressing the needs of vulnerable individuals in their interactions with law enforcement officers. Keeping centre stage an awareness of the need for a multidisciplinary response to such cases, the symposium will host expert speakers from a range of related fields, including law enforcement, the mental health profession, psychiatry, medicine, criminal justice and community agencies from Ireland, USA, Scotland, Canada and Northern Ireland.

The overarching objective of the discussion is to inform the design and implementation of a community safety co-response model in Ireland through research analysis and professional practice. The learning outcomes that are achieved through this proposed dialogue will not only be used to enhance the design of a new crisis intervention team pilot in Ireland but will also be publicly disseminated in a report to draw attention to best practice standards in meeting the needs of vulnerable persons in the criminal process.

The project represents a constituent element of An Garda Síochána's realisation of the procedural reforms recommended by the Commission on the Future of Policing in Ireland (2019).

UL research finds street sex workers face 'discriminatory behaviour' from Gardaí

A study conducted by a team of UL researchers found that street sex workers face discriminatory behaviour at the hands of An Garda Síochána. Funded by the Department of Justice, the research shows that the 2017 Criminal Law (Sexual Offences) Act has significantly affected the lives of street sex workers in urban areas. Launched in August 2022 and entitled 'I Must Be Some Person: Accounts from Street Sex Workers in Ireland', the study found that one in five street sex workers interviewed had experience of being sexually exploited by the Gardaí. The study included an investigation of street workers' knowledge and experience of the legislation around sex work since the introduction of the Criminal Law Act. The researchers argue the study is important because the voices of these street workers have largely been silent in the national discussion around legislative changes governing sex work.

The study was conducted by a team of researchers and peer-researchers in a collaboration between UL and GOSHH (Gender, Orientation, Sexual Health, HIV). The findings are based on interviews with a sample of 25 street sex workers based in Dublin (15) and Limerick (10). The report found a deep mistrust by sex workers of An Garda Síochána. It found that sex workers who face rape, violence or other crimes felt discouraged to report such incidents to Gardaí for various reasons. The report also found that around one in five sex workers have experienced incidents of officers manipulating their lack of knowledge of their legal rights. This includes threatening to charge workers with prostitution, despite outdoor sex work being decriminalised in 2017.

According to Dr Anca Minescu, author of the report and lecturer in psychology at UL, "Our findings show our current law on sex work negatively affects the lives, safety and well-being of sex workers. Portraying all sex workers in Ireland as 'exploited victims' and the way the Gardaí are interacting with the street sex workers contribute to violence and stigmatisation. This enables very serious incidents of Garda misconduct against sex workers, including sexual assault and verbal abuse, and false legal information surrounding sex work spread by others. This also leads to further marginalisation and isolation of an already economically and psychologically vulnerable population."

The report makes recommendations to the Department of Justice, which is currently reviewing the 2017 Act.

School of Law launches new security intelligence programme

In September 2022, 27 senior-ranking members of An Garda Síochána were welcomed by the School of Law onto the School's newest postgraduate programme – the Graduate Diploma in Intelligence Management. The programme was launched by course director Dr Alan Cusack (School of Law) together with Superintendent Seán Fallon (Garda National Roads Policing Bureau). Candidates also received a warm welcome address from Assistant Commissioner Orla McPartlin, Crime & Security Intelligence Service.

Representing the first programme of its kind in Ireland, the new Level 9 graduate diploma is delivered over one year through a dynamic, co-curricular model of instruction, which involves residential modules at UL with assistance from the Garda College in Templemore as well as clinical experiential learning within An Garda Síochána.

The programme has been specifically designed to provide course participants with a greater understanding of the nature of the Garda National Crime & Security Intelligence Service and how the distinct but interconnected sections within it function individually and collectively to deliver this policing and security service.

UL academic leads efforts to combat hate crime

Professor Jennifer Schweppe of the School of Law was tasked by the Committee of Experts on Hate Crime with preparing draft recommendations on combating hate crime for review and deliberation. The Committee of Experts on Hate Crime is a subordinate committee to the European Committee on Crime

Problems and to the Steering Committee on Anti-Discrimination, Diversity and Inclusion. It comprises national experts nominated by their respective governments as well as four independent experts and representatives from international organisations and civil society, of which Professor Schweppe is one. At the second meeting of the committee held in Strasbourg on 29 and 30 September 2022, Professor Schweppe presented a brief introduction and the main elements of the draft recommendations.

Giving Voice

"Sustainability for students is a stepping stone to transform our society into a regenerative culture. Personally, sustainability provides an opportunity to improve the quality of life and well-being within communities. However, challenges arise when attempting to balance economic growth with sustainable practices. It is imperative that individuals, businesses and governments work in cohesion on a global level for a more sustainable future by understanding each other's perspectives."

Matthew Murray, Year 1 BSc Social Sciences student

Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

17 PARTNERSHIPS FOR THE GOALS

UL Sustainability Challenge competition seeks to tackle climate challenges

For 50 years, UL has been at the forefront of finding solutions to today's challenges. The UL Sustainability Challenge is a competition for UL students to develop proposals to tackle our climate crisis.

The challenge seeks ambitious proposals from undergraduate and postgraduate student teams at UL to tackle climate change, with ideas or proposals to be applicable to either the campus, the city, the wider Mid-West region or even further afield. The project is a partnership between the Bernal Institute, Faculty of Science and Engineering, Kemmy Business School, Buildings and Estates and Research Office.

Launched in April 2022, the challenge was part of a programme of events taking place in 2022 to mark the 50th anniversary of UL. Five finalist teams were selected in November 2022 by an independent expert panel comprising representatives from industry and academia. These five teams received support and up to €10,000 to prepare and deliver a working pilot or demonstration of their proposal by March 2023. Showing the extent of UL's diversity, the selected projects centre on plastic recycling, thermal energy monitoring, improving sustainable agricultural practices in Africa, biodiversity in the Shannon Estuary, and efficiency improvement and cost reduction in hydrogen manufacturing.

At an event announcing the finalists, UL President Professor Kerstin Mey said, "Given the importance of sustainability for this institution, this challenge is a perfect example of how we can draw on the ambition of our student body to attempt to solve the climate issues and some of the grand challenges of our time. This concept is most certainly seen as a way to contribute to the circular economy and the circularity of materials, renewable energies, and the reduction of emissions in transport." Professor Mey added, "Initiatives like this, and many more besides, will allow us to capitalise on our strengths, and we will be looking forward to the next 50 years in order to plan and to create the purpose for the community to move forward and develop."

At the event, Professor Luuk van der Wielen, Director of the Bernal Institute, said, "Circularity of materials, renewable energy and emission reductions in transport and agri-food chains are likely career paths for our graduates. Innovative solutions will benefit from diversity and multidisciplinary. We encourage diversity across the participating teams which will benefit quality of submissions and also prepare students really well for later careers. We are very happy with the initial support among the faculties to enable students to integrate the challenge in their programmes, where appropriate."

The outcome of the challenge will be evaluated based on targets, feasibility plan, societal impact and delivery. All shortlisted projects are described in the relevant SDGs in this report.

UL welcomes international delegates for Global Partners Week

The UL Global team welcomed 49 international delegates to the UL Global Partners Week, which took place from 9 to 13 May 2022. Delegates visited UL from 14 countries and represented 22 universities.

The theme of the week, 'Celebrating 50 years of Sustainability and Inclusion in International Education', celebrated best practice in two key concerns for society today as well as marking UL's 50th birthday. Each day of the event was dedicated to a separate aspect of the overall theme, such as sustainability, equality and diversity, and inclusion. One day was set aside for delegates to tour Limerick city and the Wild Atlantic Way, including the Cliffs of Moher.

At the start of the event, Professor Máiréad Moriarty, Vice President Global and Community Engagement, said, "This is the first in-person Global Partners week to take place at UL since 2019, and it is a great pleasure to welcome our partners back to Ireland and to the UL campus. There is a busy programme of events that celebrate 50 years of inclusivity and sustainability in international education. We will be joined by many of our international education partners during this event and we look forward to showcasing the best that UL has to offer. It is fantastic to have visitors back on campus again."

Some of the international delegates who took part in the UL Global Partners Week, May-June 2022

UL City Campus hosts UNESCO Learning Cities Seminar

The UL City Centre Campus played host to a gathering of speakers as the flagship event of Limerick's Lifelong Learning Festival in May 2022. Learning Limerick hosted a UNESCO Learning Cities Seminar in UL's City Centre Campus, Sarsfield Street. The event featured guest speakers from the Irish Network of Learning Cities, including Belfast, Dublin, Cork and Derry/Strabane. As well as sharing best practice in the learning cities' presentations and panel discussion, guests were treated to cultural performances and a tour of the digital fabrication facility 'Fab Lab.'

The seminar presented Learning Limerick members with a wonderful opportunity to network with colleagues and visiting speakers, to renew links with partners and to forge some new partnerships. Addressing the guests at the seminar at UL City Centre Campus, Professor Ann Ledwith, Dean of Graduate & Professional Studies at UL, said, "It indeed is fitting that the flagship event for the Limerick Lifelong Learning Festival this year is held in this new UL campus; and it truly embraces bringing the university into the heart of the city. University of Limerick is a proud host and supporter of the annual Lifelong Learning Festival, and we are delighted to be hosting the flagship event this year."

Limerick's Lifelong Learning Festival is now in its 12th year. In 2022, the festival held over 130 events on such interesting and diverse activities as law, community, well-being, cooking, gardening, entrepreneurship, apprenticeships, kids' activities, art, technology, business and developing career options.

Incorporating SDGs into the law curriculum

In April 2022, the School of Law invited Caroline Coles, senior lecturer and International Convenor at Aston University, UK to deliver a seminar entitled 'Building UNESCO Sustainable Development Goals into the Law Curriculum'. Ms Coles chairs the Association of National Teacher Fellows and the Teaching IP and Technology sub-group of the European Intellectual Property Teachers' Network.

In her seminar, Ms Coles discussed how academic staff within the School of Law can identify multidisciplinary solutions to the challenges of sustainability and encouraged staff in attendance to reflect on how we can build global sustainability while connecting academia with the local community.

The seminar included practical discussion on how colleagues can connect with local entrepreneurs to embed SDGs in their work. Ms Coles also spoke about how she encourages student involvement in this work through 'Living Lab.' The Living Lab projects are facilitated by the Campus Living Labs Sustainability Project in a partnership between the Environmental Protection Agency and the Irish Universities' Association. The project aims to deliver evidence and introduce change that will improve campus sustainability programmes.

Aircraft leasing industry collaborates with UL to drive aviation to a sustainable future

Aircraft Leasing Ireland (ALI), the Ibec body representing aircraft lessors, launched its ESG (environment, society and governance) narrative, entitled 'Aviation Sustainability: Our Future', in January 2022. The narrative declared that ALI's 31 members will collaborate and use their influence as owners of more than half of the global fleet to lead and drive aviation towards a sustainable future. Authored in conjunction with the Oliver Wyman management consulting firm, UL and TU Delft Netherlands, the narrative outlines the tangible steps to be taken by aircraft lessors to support aviation to achieve net-zero carbon emissions by 2050. These include aircraft design, operational improvements, sustainable aviation fuel, electrical/hydrogen propulsion and recycling.

Trevor Young, Professor in Aeronautical Engineering at UL and co-author of the narrative, concluded at the launch, "The technological solutions to address sustainability in aviation are multi-layered, complex and still at an early stage. We welcome the support from industry as it is only through a focus on research that we can achieve the big step change that is required."

UL hosts national symposium on European dimension in Irish education post-Brexit

In May 2022, UL hosted a national symposium entitled 'The European Dimension in Irish Education after Brexit'. Among the more than 50 speakers from Ireland, Germany and France were Minister of State for European Affairs Thomas Byrne and Minister of State at the Department for Further and Higher Education, Research, Innovation and Science Niall Collins.

Event organiser Professor Joachim Fischer, Jean Monnet Chair in European Cultural Studies, School of Modern Languages and Applied Linguistics, said the symposium "aimed to encourage interaction between the educational sectors. Brexit has created a new situation for Ireland politically and economically which, since 2016, has led to an intensification of direct links with other EU member states and a more comprehensive engagement with the European Union." According to Professor Fischer, "This process has been further accelerated by both the COVID-19 pandemic and the war in Ukraine. The changed environment will by necessity also impact on Irish education, which aims to prepare the next generation for the future. In order to generate a necessary assessment of and a comprehensive debate about the place of Europe within Irish education, the Centre for European Studies at the University of Limerick organised the symposium to address the issue of the European dimension in all levels of Irish education, from primary schools right up to older citizens beyond the system of formal education, in line with the principle of lifelong learning. The main focus was on second and third level."

Professor Fischer said the programme would be of interest to "students, teachers, education scholars, policymakers and politicians." Speakers included representatives from all key organisations involved in teaching European studies and European languages. The symposium offered a forum where innovative

projects from Ireland and other EU member states were presented in order to chart the future for European studies in Irish education.

The event was organised in cooperation with the Office of the Minister for European Affairs, Department of Foreign Affairs; Department of Further and Higher Education, Research, Innovation and Science; European Parliament Liaison Office, Dublin; European Commission Representation, Dublin; Irish Humanities Alliance; Irish Association for Contemporary European Studies; HEA, International section; University of Limerick UL50; and Embassy of France in Dublin.

UL develops student-focused sustainability programme

Developed by the UL Centre for Sustainable Futures and Innovation, UL Student Sustainability is a co-curricular programme designed as a space for student-led sustainability across the UL campus. Co-created and implemented by students and staff, the programme provides an outlet for students to learn more about, engage with and help shape UL's journey towards a more sustainable future.

To ensure that the programme is both effective and engaging for students, Student Sustainability will trial different initiatives to engage with and hear from students, such as ideation sessions on how UL can be more sustainable, an inter-society panel discussion, sustainable living workshops and guest speakers from a range of contemporary sustainability topics.

Speaking on the programme, UL Student Sustainability Coordinator Jack O'Connor highlights the importance of placing students at the heart of a university's sustainable development: "One of the most fundamental components of any university is its student population. Students are acutely aware of the collective action needed to make the world more economically, environmentally and socially sustainable. As future decision-makers, universities have a responsibility to provide students with the skills and perspectives necessary to work on these wicked problems, which is what we envisage Student Sustainability contributing to."

A volunteer team of six students was selected to deliver UL Student Sustainability, which will launch in January 2023. The aim of the inaugural team is to lay a strong foundation to be developed upon for the full 2023/24 academic year. Refer back to the Student Sustainability Coordinator's foreword for more details on the programme.

UL hosts Critical Perspectives on Sustainable Development annual conference

In partnership with DSA Ireland (DSAI), UL hosted the 2022 Critical Perspectives on Sustainable Development annual conference in November. The conference focused on addressing the challenges associated with sustainable development and explored new ways forward. DSAI is an independent, all-Ireland association of researchers, scholars, policymakers and practitioners working in the area of international development.

In the context of unfolding climate breakdown with the socio-political implications becoming more apparent, the conference re-examined, once again, the concept of sustainable development. Although sustainable development is clearly a central value in the UN SDGs and in many countries' policy frameworks, the claim underlying the concept has been subject to critical analysis for some time. The attendees were required to think about how to address these challenges so that, moving forward, they can engage with initiatives and collective responses that contribute to finding solutions to these complex issues.

EMERGE meets at UL

Comprising nine regional HEIs located on the margins of Europe, European Margins Engaging for Regional and Global Empowerment (EMERGE) is an alliance that strives to develop flexible and innovative approaches to knowledge co-creation and human capital. EMERGE met at UL in December 2022 to develop a European Universities Initiative (EUI) proposal.

The EMERGE consortium was founded in 2019 by Dr Lesley Lelourec, Vice President for Internationalisation, Université Rennes 2, France with the aim of becoming an EUI. In October 2021, UL was elected to lead the consortium under Professor Mairead Moriarty, Vice President Global and Community Engagement.

In Brussels in March 2022, along with the other EMERGE university leaders, UL President Professor Kerstin Mey signed a memorandum of understanding that signalled the alliance's intent to lead an EUI consortium. UL was the first Irish university to register its intent to apply to the initiative as a coordinator of EMERGE, which it hopes to do early in 2023.

UL Provost & Deputy President Shane Kilcommins welcomed the EMERGE presidents and their representatives to Plassey House on behalf of President Mey. In his opening remarks, Professor Kilcommins said, "I am delighted that we can come together again to meet the representatives from the consortium. Today, and over the next number of days, we will work on building the alignment and reaffirming our full support of the mission, vision and values of the EMERGE consortium. Through EMERGE, we can avail of the opportunities that we have to use the consortium for bi- and multi-lateral projects as well as for funding from Europe. In these ways, we can enhance trust and understanding and strengthen the consortium as a whole."

The UL gathering was the first in-person meeting of the leaders of universities, which have over 110,000 students combined, and the commitment ceremony was followed by three intensive days of working together to develop the proposal. As well as planning the long-term strategy of the EMERGE consortium, the group took time out to enjoy performances by George Kenny and Ella McGrory, students of the Irish World Academy of Music and Dance.

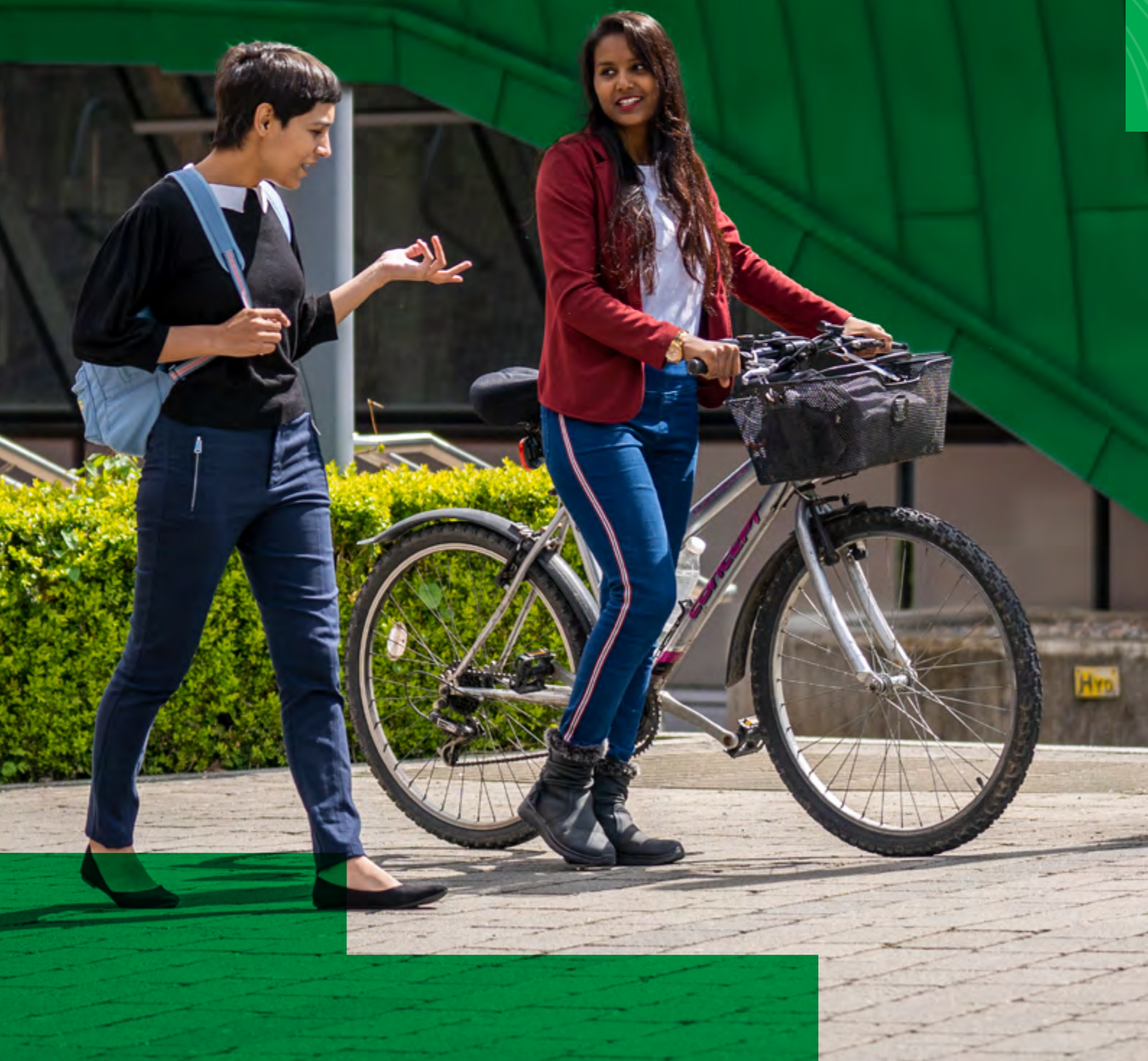
EMERGE leaders meet at UL in December 2022

Giving Voice

"It is absolutely vital that the arts and humanities contribute to a more sustainable world by critically assessing the status quo as well as by communicating climate change, e.g., by making scientific facts accessible to the wider public, by promoting dialogue and by raising awareness in society. Not only because arts students often act as multiplicators in their future careers, the university also has a responsibility to incorporate environmental topics into the curriculum of any course."

Anne Nospickel, DAAD-Lektorin, School of Modern Languages and Applied Linguistics (German Section)

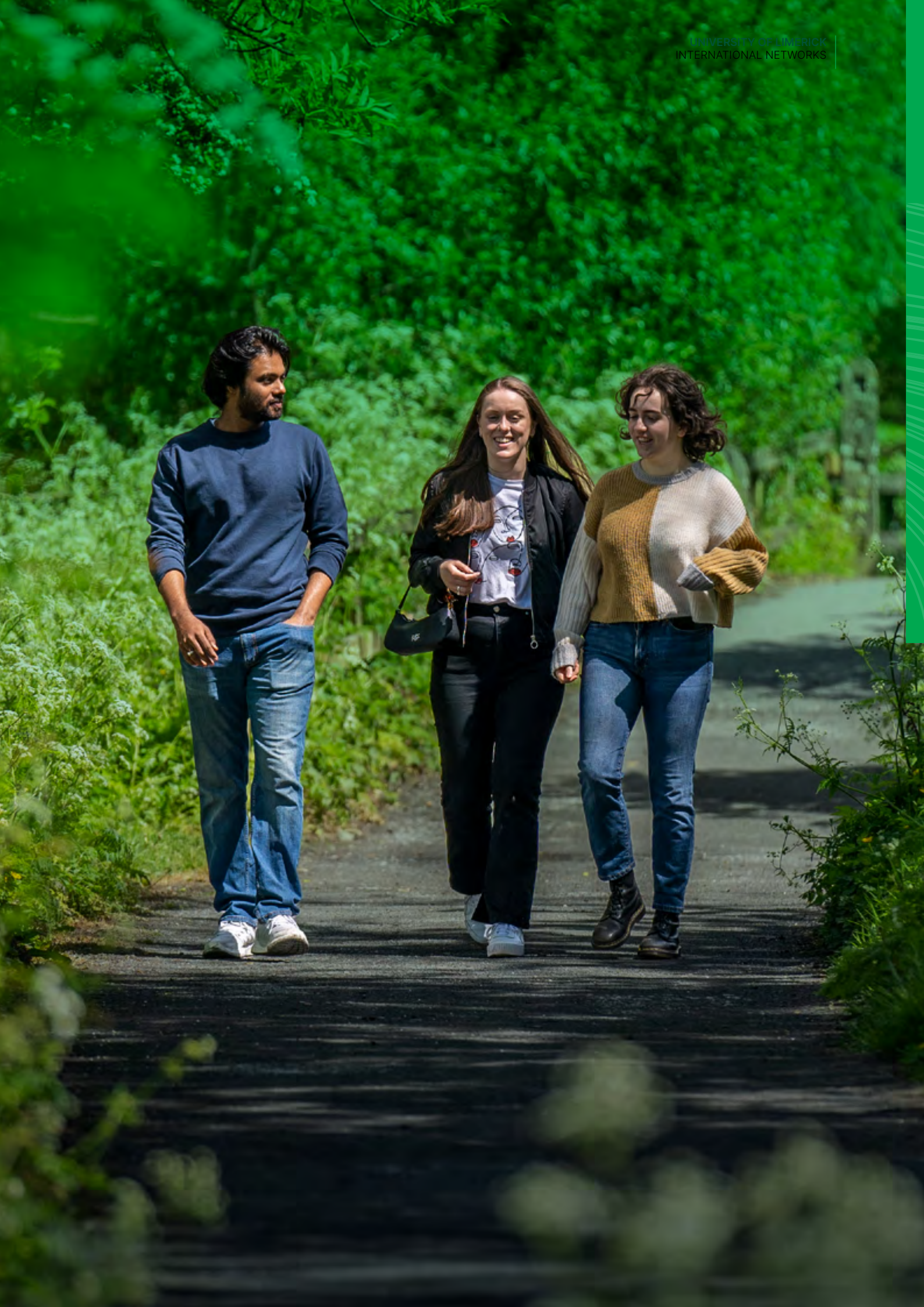
Impact Rankings



University Impact Rankings 2022

Times Higher Education (THE) – SDG Ranking Breakdown

SDG	UL
OVERALL - THE IMPACT RANKINGS 2022 RESULT	**101-200**
SDG 3: **Good Health and Well-Being**	101–200
SDG 5: **Gender Equality**	201–300
SDG 7: **Affordable and Clean Energy**	101–200
SDG 8: **Decent Work and Economic Growth**	39
SDG 11: **Sustainable Cities and Communities**	48
SDG 12: **Responsible Consumption and Production**	201–300
SDG 16: **Peace, Justice and Strong Institutions**	90
SDG 17: **Partnerships for the Goals**	101–200



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