

# ECIU University Research Conference

Engaging society through  
challenge-based R&I  
and learning

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Barcelona, Spain  
3-4 October, 2023

**BOOK OF  
ABSTRACTS**



The SMART-ER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101016888. This result only reflects the author's view and the EU is not responsible for any use that may be made of the information it contains.



Co-funded by  
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**Welcome Message  
ECIU University  
Research  
Conference**

It's my pleasure to welcome you to the first Research Conference organized by ECIU University through the SMART-ER team. This will be the first time in which ECIU researchers will meet and share their experiences around the so-called *Challenge Based Approach in Research* (CBR). It will be also a great opportunity to meet with other societal stakeholders who undoubtedly are a crucial part of our International University. Research is more than ever an interdisciplinary activity connected with real life challenges, and the commitment of our university is to play a key role in promoting collaboration between researchers, research groups and societal stakeholders coming from the industry, local authorities, public and private organizations working together to create the best solutions and better opportunities for all.

This congress will show the extraordinary dynamism of our researchers and research groups and the great opportunity we're having on working together, promoting these innovation arenas in each of our connected territories, enriching and boosting the possibilities of engagement between societal actors. It will surely show – with lights and shades – what we have already achieved while working this way. We know that this great challenge has already mobilised more than 2000 researchers from our 14 institutions. We have more than 300 attending the conference.

We're very happy and enthusiastic seeing the work already done, and we're also convinced that the best is yet to come in the near future. May this encounter serve as a visible milestone, where we will share, together with all our partners, our strong commitment with this approach that will help us to face needs and challenges affecting our society. I'm truly convinced that we will remember this first conference, and I would like to thank all the SMART-ER team and all the big number of colleagues from our partner institutions who have made this event and the successful achievements a reality. I also would like to thank our partners from public and private institutions for their active engagement in our joint challenge. I wish all the participants a very fruitful and stimulating conference.

**Màrius Martínez Muñoz**

ECIU President

I welcome you to the ECIU University Research Conference in Barcelona. This is an exciting conference for the ECIU community. It is the first time we have brought external partners and the research community across the ECIU to apply the challenge-based approach. We are doing this because we believe that education, research and innovation can only thrive in well-connected ecosystems with strong collaboration between various actors. In this conference, we will experience how we can co-operate with the society, cities and businesses to solve real-life challenges in a unique, flexible way with the overall goal of driving societal impact.

Since the beginning, the 14 ECIU universities have constantly challenged conventional education, research, and innovation models. ECIU today tries to tackle societal challenges with its most significant endeavour so far, the ECIU University. Our joint ECIU University nourishes strategic collaborations between cities, regions, industry, and citizens under the framework of SDG11 of the United Nations (*Make cities and human settlements inclusive, safe, resilient and sustainable*). This approach differs from the old models of viewing universities as singular entities. Hence, we consider ECIU University as one player in a European ecosystem of industry and SMEs, learners, researchers, NGOs, regions, and municipalities.

During the next two days, we will work in multidisciplinary teams of researchers and stakeholders on real-life challenges in Energy and Sustainability, Circular Economy, Transport and Mobility, Resilient Communities and Citizen Science. We are part of the learning process by being part of a challenge. We will discuss how we can facilitate collaboration with different stakeholders of the society in the research process to strengthen the approach towards societal impact.

Putting a conference with a novel approach together is a challenge. I want to express my most sincere gratitude to the Universitat Autònoma de Barcelona colleagues, the ECIU-wide SMART-ER team, and all the colleagues who took up this challenge of organizing the first ECIU University Research Conference! Thanks to all the participants for contributing with a challenge, presentation, poster and active participation in a challenge team. Let us enjoy the conference, share good practices of innovative research approaches, and become learners and community members to identify new or nurture already existing collaborations with the ECIU University community to create an impact.

**Katrin Dircksen**

ECIU Secretary General

On behalf of the Scientific Committee of the first ECIU University Research Conference, I have a great pleasure in welcoming all the participants to this open and participatory event. This conference will be an interactive forum for our stakeholders and the research community to present and discuss common challenges.

Organized by ECIU University and its Virtual Research Institute of Smart European Regions (SMART-ER VRI), we are starting a new research vision based on the challenge-based-research and citizen participation.

The conference aims to bring together societal stakeholders to showcase challenge-based research outcomes, share best practices of innovative research approaches, and explore and initiate potential collaborations for common solutions to societal issues. It reflects a new kind of open and participatory science. You will be presented with numerous opportunities to expand your engagement with new communities of practice and convey your concerns. The conveners acknowledge that the whole is greater than the sum of its parts.

The conference started a few months ago with the call for the challenges, mainly addressed to researchers and stakeholders, and the call for posters, addressed to Ph.D. students from ECIU member universities. The challenges address well-defined open problems relevant to SDG 11 to make cities sustainable, inclusive, equitable, safe, healthy, and collaborative places. Through this selection process, we aim to establish communities and explore prospects for continued collaborative efforts.

Outside of the conference, I hope you will enjoy some of the many attractions found in the UAB campus and the tours offered here. The two-day conference will cover four plenary sessions, twelve thematic sessions, and the poster sessions.

I thank the Conference Committee for their dedication in organizing the programme and all the stakeholders, authors, and other contributors for their efforts.

**Xavier Gabarrell**

Scientific Director SMART-ER



**Conference  
Programme**

# Monday, 2 October 2023

**Venue** – Universitat Autònoma de Barcelona – ECIU office, Plaça Cívica, Campus UAB

11.00–  
16.00

## EARLY REGISTRATION AT UNIVERSITAT AUTÒNOMA DE BARCELONA – ECIU OFFICE

16.00–  
17.30

## UNIVERSITAT AUTÒNOMA DE BARCELONA TOURS

The purpose of the tour is welcoming ECIU member participants and stakeholders to UAB and sharing singular research infrastructures as well as master and PhD programmes connected with them. Participants may choose one of the following infrastructures to visit:

### UAB OPEN LABS

#### Open LABS

The UAB Open Labs are an open innovation ecosystem where researchers, companies, civil society or public administration work together to co-create knowledge and to solve social challenges of the territory through the use of digital technologies. UAB Open Labs embrace 6 facilities: the Audio Lab, the Digital Lab, the Disseny Lab, the Laboratory of Ecology and Territory, the Media Lab, and the RecicLab. All of them are emplaced at the UAB Campus. During the visit, the Disseny and Digital Labs will be explored, and the equipment, methodologies, and the most relevant user experiences will be shared.



#### ICTA

The Institute of Environmental Science and Technology (ICTA-UAB) is a multi-disciplinary centre which promotes academic research and postgraduate education in the environmental sciences. It aims to improve our understanding of the global environmental change, as well as the nature and causes of environmental problems. In addition, it studies policies, strategies and technologies to foster a transition to a sustainable economy. The visit will include a tour to the ICTA building, which satisfies high energy-efficiency standards, and which has achieved the LEED GOLD certification by the US Green Building Council, the description of their research lines and main activities, and the rooftop green garden.



#### Food Technology Pilot Plant & Experimental Farm (SPTA Aliments)

The food technology pilot plant provides consulting services, assistance and technical training to the scientific and business community in the field of food processing in R&D, as well as support to the teaching staff in the realization of practical lessons with the equipment and food processing facilities of the Pilot plant. In turn, the Experimental Farm disposes of spaces, facilities, material equipment and personnel so as to support research requiring the use of animals or plants. During the visit, you will not only be guided through its spaces, but also some of the most relevant activities taking place in these spaces will be shared.



# Tuesday, 3 October 2023

**Venue** – EXE HOTEL CAMPUS, Campus UAB

8.00–  
8.45

## REGISTRATION/POSTER HANG UP

8.45–  
9.30

## OPENING SESSION

by [Javier Lafuente](#) (UAB Rector), [Màrius Martínez Muñoz](#) (ECIU President),  
[Katrin Dircksen](#) (ECIU Secretary General), [Xavier Gabarrell Durany](#) (SMART-ER Scientific Director)  
Next steps for European universities in research (Stijn Delaure, Policy Officer, European Commission)

9.30–  
10.30

## PLENARY SESSION

*Public Engagement: Challenges&Opportunities* (Troels Jacobsen, University of Stavanger)

10.30–11.00 **COFFEE BREAK** 

11.00–  
11.30

Opportunities and future calls (parallel sessions): for each community provided by the R&I ECIU  
Expert group:

- R&I group Circular Economy/ Energy and Sustainability
- R&I group Transport and Mobility
- R&I group Resilient Communities

11.30–  
13.00

Thematic session around selected challenges (parallel sessions):

- Systemic changes in Circular Economy ecosystem and supply chains of the textile industry (Olga Dziubaniuk, Tampere University)
- Barriers and opportunities towards 15-minute cities in urban cores and outskirts (Mehmet Baran Ulak, University of Twente)
- The MAD House. Regenerative, Inclusive, Climate Resilient Homes Built for Extreme Environments (Fiona Hazell and Emelie Ekblad, MAD Foundation)

13.00–14.30 **LUNCH BREAK** 

13.45–  
14.25

## POSTER SESSION

14.30–  
16.00

## PLENARY SESSION

*SMART-ER Seed Programme* (Artur Silva, University of Aveiro)

16.00–  
17.30

Thematic session around selected challenges (parallel sessions):

- Challenges in the actor network when upscaling use of electric freight trucks in logistics systems (Henrik Gillström, Linköping University)
- Reducing packaging establishing a return and reuse systems for cosmetics and home care products (Kerstin Kuchta, Hamburg University of Technology)
- Climate adaptation – management of wildfires (Poppy Kalesi, International coordinator, Rogaland County Council)

16.00–  
17.30

## UNIVERSITAT AUTÒNOMA DE BARCELONA TOUR

Open Labs/ICTA/SPTA Aliments

20.00

## NETWORKING DINNER

Barcelona City center (Casa de la Convalescència)

# Wednesday, 4 October 2023

**Venue** – EXE HOTEL CAMPUS, Campus UAB

8.00–  
8.45

## CITIZEN SCIENCE COMMUNITY BREAKFAST

Fernando Vilariño (Universitat Autònoma de Barcelona)

8.45–  
9.30

## EUA OPEN SCIENCE AGENDA 2025

Stephane Berghmans (Director Research & Innovation European University Association)

9.30–  
11.00

## PLENARY SESSION

*SMART-ER Citizen Science pilots lessons learnt*

(Fernando Vilariño, Universitat Autònoma de Barcelona)

11.00–11.30 **COFFEE BREAK** 

11.30–  
13.00

Thematic session around selected challenges (parallel sessions):

- A distributed ECIU Living Lab: approach to tackle urban sustainability transformations (Tina-Simone Neset, Linköping University)
- How can we make safer mobility situations for biking and walking in the 15 min city? Emotions and 1st law of geography in reality (Andrea Victoria Hernandez Bueno, Aalborg University)
- Upskilling and Reskilling in the Age of AI (Meda Andrijauskienė and Rūta Čiutienė, Kaunas University of Technology)

13.00–14.00 **LUNCH BREAK/POSTER SESSION** 

14.00–  
14.30

## ESTABLISHING OPEN SCIENCE AS THE “NEW NORMAL”

Karel Luyben (President of European Open Science Cloud Association)

14.30–  
16.00

Thematic session around selected challenges (parallel sessions):

- Mission cities:100 Climate-neutral and Smart cities by 2030 Mission (Fiona Hazell, ECIU University)
- Towards sustainable and resilient smart industrial parks (Silvia Solanellas, General manager of UPIC)
- Where education and research ( can) meet (Andrea Brose, ECIU University)

16.00–  
16.30

## CLOSING CEREMONY



# Lists

**List of Challenges** *12*

**List of Posters** *12*

**List of SMART-ER Seed Projects** *14*

**List of Citizen Science Pilot Projects** *14*

## LIST OF CHALLENGES

1. **Upskilling and Reskilling in the Age of AI.**  
Meda Andrijauskienė, Rūta Čiutienė, Kaunas University of Technology.
2. **Systemic Changes in Circular Economy Ecosystem and Supply Chains of the Textile Industry.**  
Olga Dziubaniuk, Tampere University.
3. **Challenges in the Actor Network When Upscaling Use of Electric Freight Trucks in Logistics Systems.**  
Henrik Gillström, Linköping University.
4. **The MAD House. Regenerative, Inclusive, Climate Resilient Homes Built for Extreme Environments.**  
Fiona Hazell, Emelie Ekblad, MAD Foundation.
5. **How Can We Make Safer Mobility Situations for Biking and Walking in the 15-min City? Emotions and 1st Law of Geography in Reality.** Andrea Victoria Hernandez Bueno, Aalborg University.
6. **Climate Adaptation – Management of Wildfires.**  
Poppy Kalesi, International coordinator, Rogaland County Council.
7. **Reducing Packaging Establishing a Return and Reuse Systems for Cosmetics and Home Care Products.**  
Kerstin Kuchta, Hamburg University of Technology.
8. **A Distributed ECIU Living Lab: Approach to Tackle Urban Sustainability Transformations.**  
Tina-Simone Neset, Linköping University.
9. **Towards Sustainable and Resilient Smart Industrial Parks.**  
Silvia Solanellas, Unió de Polígons Industrials de Catalunya.
10. **Barriers and Opportunities towards 15-minute Cities in Urban Cores and Outskirts.**  
Mehmet Baran Ulak, University of Twente.
11. **Mission Cities: 100 Climate-neutral and Smart Cities by 2030.**  
Fiona Hazell, ECIU University.
12. **Where Education and Research (can) Meet.**  
Andrea Brose, ECIU University.

## LIST OF POSTERS

1. **Array Signal Processing for Water Leak Detection.**  
Pedro H. M. C. Matos, University of Trento.
2. **Assessing Social and Environmental Impacts of Autonomous Shuttle Connectivity in Suburbs.**  
Jorge Marto Bandeira, Eloisa Macedo, University of Aveiro; Steve O'Hern, Heikki Liimatainen, Tampere University; Birutė Jatautaitė, Solveiga Stankevičienė, Kaunas University of Technology.
3. **Infrastructure of Public Spaces through Participatory Methods and the Use of ICTs.**  
Sergio Alvarado Vazquez, University of Twente.
4. **Circularity in Industrial Wastewater Treatment: Valorisation of Metallurgic Waste as Catalyst of Fenton Process.** João Peres Ribeiro, University of Aveiro.
5. **The Challenges of Future Literacy: Anticipating the Needs of Ever-changing Communities.**  
Mario Giagnorio, University of Trento.
6. **Changing Travel Modes: How has COVID-19 Impacted Transport Mode Choice in Ireland?**  
Erica Fox, Dublin City University.
7. **Designing for Sustainability and Safety in Urban Micro-Mobility: a Novel Helmet Concept.**  
Gabriel Serra, University of Aveiro.
8. **Open Governance of Entrepreneurial Ecosystems: Engaging the Local Community.**  
João Almeida, University of Aveiro.
9. **Interaction Study between Soil Properties and Liquefaction Potential of Wind Turbine Foundations.**  
Wenhao Huang, Groupe INSA – Institut National des Sciences Appliquées.

10. **Statistical Study at European Cities Scale for Characterization and Replication of Integrated Building Renovation Services.** Estay Lucas, Groupe INSA – Institut National des Sciences Appliquées.
11. **Treatment of Salt-derived Brine by Electrocoagulation Process Followed by Corrosion Evaluation for Future Applications.** Luana Sarinho, University of Aveiro.
12. **Agricultural Series-Hybrid Drive Efficiency Modeling Based on Experimental Data.** Ugnė Koletė Medževėpytė, Kaunas University of Technology.
13. **Taste the Difference: a Journey into Solanum Lycopersicum Varieties and Fertilizations.** Guido Evangelista, Universitat Autònoma de Barcelona.
14. **Diffused Light Concentration for Enhanced Solar Energy Yield.** Mathis Van de Voorde, University of Twente.
15. **Strategies to Improve Producer Gas Quality from Residual Forest Biomass Gasification.** Helena Gil Martins de Faria Gomes, University of Aveiro.
16. **An ECIU Micromodule on Global Warming, Renewable Energy, and Decarbonization.** Jeffrey Amelse, University of Aveiro.
17. **Participatory Approach for Sustainable City-Region Food Systems: A Case Study of a Peri-Urban Horticulture Project.** Pietro Tonini, Universitat Autònoma de Barcelona.
18. **Universities as Regional Change Architects.** Alina Meloyan, University of Stavanger.
19. **Linking Air Pollution, Green Initiatives, and Human Health: Where Are We?** Regina Maria Brandão de Oliveira Duarte, University of Aveiro; Mélanie Mignot, Groupe INSA – Institut National des Sciences Appliquées; Justine Blanford, University of Twente; Violeta Kaunelienė, Kaunas University of Technology; Bruno Neves, University of Aveiro.
20. **Circular Fashion: Designing Clothes for Closed-Loop Recycling.** Veronika Budovska Lorentzen, University of Stavanger.
21. **A Smart Education for a Smart City.** Sanaz Masoumeh Shahverdi, Alessandra Scroccaro, Asta Daunorienė, Kaunas University of Technology.
22. **Digital Twin for Comparative Analysis of Buildings' Thermal Dynamics Models.** Lina Morkūnaitė, Kaunas University of Technology.
23. **Resilient Communities in Schoolyards, the Example of Rotterdam.** Paula Beatriz Presser de Santana, University of Twente.
24. **Intelligent Methodologies for Digital and Sustainable Manufacturing in Machining.** Sílvia Carvalho, University of Aveiro.
25. **How Institutions Shape Circular Systems – Comparative Analysis of Package Deposit Systems in Australia and Finland.** Linnea Harala, Tampere University.
26. **Use of Insect Breeding Waste in Fertilizer Production.** Goda Gudinskaitė, Kaunas University of Technology.
27. **Employing Digital Twin Technology for Autism Friendly Navigation Indoors.** Jaime B. Fernandez, Ali Muhammad Intizar, Noel O'Connor, Sukanya Mandal, Kieran Mahon, Dublin City University; Andrius Jurelionis, Kaunas University of Technology.
28. **Characterisation of Glazed Balconies in Finland: Preliminary Findings from a Literature Review.** Léna Jegard, Tampere University.
29. **Implementing Challenge-based Learning in Distance Mode: the Case of ECIU.** Vilma Sukackė, Kaunas University of Technology.
30. **Engaging with the Future: International Cooperation for Resilient Communities – a New Challenge Proposal for the ECIU Community.** Francesca Odella, University of Trento.
31. **Agroecological Landscapes: Planning Food and Environmental Dynamics in Urban-Rural Areas.** Angelica Pianegonda, University of Trento.
32. **Flax Fibers as New Filter for Metals Removal from Runoff Waters.** Juliette Vievard, Groupe INSA – Institut National des Sciences Appliquées.

33. **Manufacturing of Anode-supported Thin Film Electrolyte Membranes for Solid Oxide Fuel.**  
Carlos Almeida, University of Aveiro.
34. **Safe and Circular Biofuel Production from Lignocellulosic Biomass.**  
Sindi Baco, Groupe INSA – Institut National des Sciences Appliquées.
35. **Strategic Development of Companies for a Circular Economy: the Process.**  
Jenni Kaipainen, Tampere University.
36. **Placing Citizen Engagement at the Heart of AI Research and Innovation.**  
Laura Grehan, Emma Clarke, Dublin City University; Núria Martínez Segura, Universitat Autònoma de Barcelona.
37. **Beyond Public Engagement: ECIU Embracing Empowerment, Inclusivity, and Equity in Citizen Science.**  
Maya van den Berg, Ria Wolkorte, University of Twente; Tina Neset, Karin Eliasson, Linköping University; Ana Daniel, Susana Ambrosio University of Aveiro; Eglė Butkevičienė, Kaunas University of Technology; Patricia Farrell Donahue, Raúl Castano De la Rosa, Pauliina Lehtonen, Tampere University; Valesca Lima, Aishling Silke Dublic City University.

### LIST OF SMART-ER SEED PROJECTS

1. **Digital Media Network Doctoral Experience (DiMeNDx).** Coordinator institution – University of Aveiro.
2. **Efficient and Sustainable Refrigeration Systems Integrating Heat Storage Materials and Radiative Cooling (ESRS-HSRC).** Coordinator institution – University of Aveiro.
3. **Array Signal Processing for Water Leak Detection (ASPWLD).** Coordinator institution – University of Trento.
4. **Development of High Capacity Hydrogen Fuel Tank Prototype for Vehicular Applications (DHCPHV).** Coordinator institution – University of Aveiro.
5. **Sustainable and Dependable AI (SuDAI).** Coordinator institution – University of Twente.
6. **Reversing Inequalities and Promoting Solidarity in Health at the European Level: Towards a Research Network on the European Health Union (RN4EUHEALTH).** Coordinator institution – Dublin City University.
7. **BrownBin – Household Food Waste New Life under Sustainable Cities: a Feasibility Study (BrownBin).** Coordinator institution – University of Aveiro.
8. **Erasmus Sustainable Mobility.** Coordinator institution – Universitat Autònoma de Barcelona.
9. **Interface-friendly Hole-Transporting Materials for Low-cost and Stable Perovskite Solar Cells.** Coordinator institution – Kaunas University of Technology.
10. **ECIU Urban Transformation Collaboratory.** Coordinator institution – Linköping University.
11. **Research Network on Resilient Communities.** Coordinator institution – University of Aveiro.
12. **Interdisciplinary Networking for a Sustainable and Circular Economy.** Coordinator institution – Kaunas University of Technology.
13. **Digital Twins for Energy Optimization.** Coordinator institution – Kaunas University of Technology.
14. **Sustainable Biological Management of Nitrogenous Liquid Streams from Air Emission Control.** Coordinator institution – Tampere University.

### LIST OF CITIZEN SCIENCE PILOT PROJECTS

1. **Citizen Arenas for Improved Environmental Quality & Resource Use in SMART-ER CITIES.**  
Coordinator institution – Dublin City University.
2. **Empowering Urban Cyclists through Citizen Science.**  
Coordinator institution – Universitat Autònoma de Barcelona.
3. **Establishing a Community on Empowering, Inclusive, and Equitable Citizen Science within ECIU.**  
Coordinator institution – University of Twente.



**Plenary  
Sessions**

## PLENARY SESSION. *Public Engagement: Challenges & Opportunities*

Troels Jacobsen, University of Stavanger

SMART-ER aims to integrate public engagement in all the activities led by the Virtual Research Institute and to facilitate processes related to engaging all the different stakeholders of the society in the research process.

We define public engagement as participatory multi-actor dialogues and exchanges to foster mutual understanding, co-create research and innovation outcomes, and provide input to policy agendas.

Engaging with its various public is of an increasing importance to higher education in Europe and globally. It allows the sector to strengthen its relevance, responsiveness, and accountability in a sustainable manner.

Plenary session on public engagement introduces guideline recommendations for public engagement and round table discussions moderated by Ronaldo Munck:

- Begonya Saez Tajafuerce, Institut d'Humanitats de Barcelona;
- Poppy Kalesi, Stavanger County;
- Roberto Martins, University of Aveiro;
- Kathryn Higgins, Belfast University.

## PLENARY SESSION. *SMART-ER Seed Programme*

Artur Silva, University of Aveiro

The SMART-ER Seed Programme supports research career development and the implementation of a shared R&I agenda through the training, mobility and engagement in international, cross-disciplinary and intersectoral collaboration of ECIU University researchers focused on UN SDG11.

The Seed Programme supported initiatives focused on three main directions:

1. Co-tutelle of PhD students and industrial doctorates;
2. Blended mobility to create networks;
3. SMART-ER Seed Projects.

The plenary session presents an overview and outcomes from the SMART-ER Seed Programme, Seed projects and networks.

## SMART-ER Seed Programme – results & impact

**14.30 SMART-ER SEED PROGRAMME – OVERVIEW** / Artur Silva

### SPA2 – Blended mobility to create networks

**14.40 Interdisciplinary Networking for a Sustainable and Circular Economy (INSCE)** / Viktorija Varaniūtė

**14.45 Reversing Inequalities and Promoting Solidarity in Health at the European Level: Towards a Research Network on the European Health Union** / Volkan Yilmaz

**14.50 Research Network on Resilient Communities** / Ana Dias Daniel

**14.55 Digital Media Network Doctoral Experience** / Rui Raposo



### SPA3 – Seed Projects

- 15.00**    **Interface-Friendly Hole-transporting Materials for Low-Cost and Stable Perovskite Solar Cells** / Dmytro Volyniuk
- 15.10**    **BrownBin – Household Food Waste New Life under Sustainable Cities: a Feasibility Study** / Manuel A. Coimbra
- 15.20**    **Erasmus Sustainable Mobility** / Oriol Marquet
- 15.30**    **Eciu Urban Transformation Collaboratory** / Tina-Simone Neset
- 15.40**    **Development of High Capacity Hydrogen Fuel Tank Prototype for Vehicular** / Pukazh Selvan
- 15.50**    **OPEN DISCUSSION** / Artur Silva

### **PLENARY SESSION. SMART-ER Citizen Science Pilots Lessons Learnt**

Fernando Vilariño, [Universitat Autònoma de Barcelona](#)

Citizen Science, together with the integration of the stakeholders in the different processes of the research cycle, is a fundamental pillar of the SMART-ER project.

The SMART-ER project has tested 3 CS pilots developed through a co-creation process:

1. Citizen arenas for improved environmental quality & resource use in SMART-ER cities;
2. Empowering urban cyclists through citizen science;
3. Establishing a community on empowering, inclusive, and equitable citizen science within ECIU.

The plenary session explains the process of co-creation and the lessons learnt in the three different pilot projects.



**Abstracts of  
Challenges**

## UPSKILLING AND RESKILLING IN THE AGE OF AI

Research area: Resilient Communities

### Background

According to the World Economic Forum Report (2023), Artificial Intelligence (AI) is expected to be adopted by nearly 75% of the surveyed companies: 50% of organizations think that it will create job growth, whereas 25% expect it to lead to job losses.

Labour-market transformations are driven by technological breakthroughs, and there is a number of different obstacles, such as: skills mismatch; lack of investment in training and education; job displacement; resistance to change; lack of accessibility and inclusion.

### Challenge

How could we improve skills around *Artificial Intelligence* in order to adapt the workforce to the technological transformations of companies?

### Challenge providers

[Meda Andrijauskienė](#) / Kaunas University of Technology

[Rūta Čiutienė](#) / Kaunas University of Technology

[Nina Szczygiel](#) / University of Aveiro

## SYSTEMIC CHANGES IN CIRCULAR ECONOMY ECOSYSTEM AND SUPPLY CHAINS OF THE TEXTILE INDUSTRY

Research area: Circular Economy

### Background

The transition to a circular textile industry must be seen as a fundamental change and not as a shift of the status quo to ensure its impact. Circular Economy (CE) in the textile industry is typically characterised with such complexity due to the global supply chain flows and the involvement of diverse stakeholders.

The key challenges are inefficient knowledge networks, missing actors facilitating supply chains, low consumer interest in the products of recycled materials, short-term economic profitability, and incentives. However, the adoption of Circular Economy in the textile industry is a strategic step for companies that can maintain economic sustainability in the long-term perspective, be innovative in technologies and business models, and create positive social input by influencing consumption habits and decreasing the environmental impact.

### Challenge

How could we generate transition towards the circular economy within the textile industry sector, while including all actors in the production process, in order to reduce CO<sub>2</sub> emissions?

### Challenge providers

[Olga Dziubaniuk](#) / Tampere University

[Promporn Wangwacharakul](#) / Linköping University

[Erik Sandberg](#) / Linköping University

[Jurgita Bruneckienė](#) / Kaunas University of Technology

[Viktorija Varaniūtė](#) / Kaunas University of Technology

[Lina Dagilienė](#) / Kaunas University of Technology

## HOW CAN WE MAKE SAFER MOBILITY SITUATIONS FOR BIKING AND WALKING IN THE 15-MIN CITY? EMOTIONS AND 1<sup>ST</sup> LAW OF GEOGRAPHY IN REALITY

Research area: Transport and Mobility

### Background

The 15-minute city is an urban planning concept in which most daily necessities and services, such as work, shopping, education, healthcare, and leisure can be easily reached by a 15-minute walk or bike ride from any point in the city.

In this way, it requires different sources of data and analysis across different urban and planning scales and levels to redesign mobility corridors.

### Challenge

Taking as a case a road in Aalborg that accommodates car, bicycle and pedestrian mobility and parking spaces, this challenge aims to answer the question: how can we make safer mobility situations for biking and walking in a 15-minute city?

### Challenge providers

[Andrea Victoria Hernandez Bueno](#) / Aalborg University

[M. Baran Ulak](#) / University of Twente

[Anna Grigolon](#) / University of Twente

[Karst T. Geurs](#) / University of Twente

## CHALLENGES IN THE ACTOR NETWORK WHEN UPSCALING USE OF ELECTRIC FREIGHT TRUCKS IN LOGISTICS SYSTEMS

Research area: Transport and Mobility

### Background

One of the main challenges in creating a sustainable society is to reduce our climate impact. Electrification of freight deliveries has shown great potential and is steadily rising on agendas, and the most de-veloped technology is battery electric trucks with stationary charging. However, there are also downsides which challenge the current set-ups of logistics systems, such as the limited range, a lower payload, an increased investment cost of trucks, and the charging needs to be included in the system.

### Challenge

How can we know the changes that will take place in the relations between the actors when the electric trucks become the new normal?

### Challenge providers

[Henrik Gillström](#) / Linköping University

[Sheba Nair](#) / Tampere University

[Erika Kallionpää](#) / Tampere University

[Barbara Galińska](#) / Lodz University of Technology

[My Jobrant](#) / Linköping University

[Per Lindahl](#) / Logistika (regional platform to drive the region forward sustainable logistics region)

## THE MAD HOUSE. REGENERATIVE, INCLUSIVE, CLIMATE RESILIENT HOMES BUILT FOR EXTREME ENVIRONMENTS

Research area: Resilient Communities

### Background

The built environment generates 40% of annual global CO<sub>2</sub> emissions. Of those total emissions, building operations are responsible for 27% annually, while building and infrastructure materials and construction (typically referred to as embodied carbon) are responsible for an additional 13% annually.

With a growing global population and an increase in extreme climatic conditions, we need to reassess how we build and live.

### Challenge

How could we reduce CO<sub>2</sub> emissions in the construction and maintenance of homes so that to slow down the climate change?

### Challenge providers

[Fiona Hazell](#) / MAD Foundation

[Emelie Ekblad](#) / MAD Foundation

[Raul Castano De la Rosa](#) / Tampere University

[Verónica Arcas](#) / Universitat Autònoma de Barcelona

## CLIMATE ADAPTATION – MANAGEMENT OF WILDFIRES

Research area: Resilient Communities

### Background

Across Rogaland, many cities are at great risk of wildfires as they are built close to heather and mostly use wood in construction. In this way, many places in municipalities are at risk of burning down.

### Challenge

How could we use nature-based solutions to prevent heather and forest fires near settlements and near infrastructure, roads, railways, power lines and water sources?

### Challenge providers

[Poppy Kalesi](#) / Rogaland County Council

[Inger Kristine Volden](#) / Haugesund Municipality

[Helene Odegaard](#) / Stavanger Municipality

[Anders Riel Müller](#) / University of Stavanger

[Konstantinos Kourkoutas](#) / Universitat Autònoma de Barcelona

## REDUCING PACKAGING ESTABLISHING A RETURN AND REUSE SYSTEMS FOR COSMETICS AND HOME CARE PRODUCTS

Research area: Circular Economy

### Background

Reuse systems are no radical innovation. They have been around for thousands of years...

Reducing packaging establishing a return and reuse systems for cosmetics and home care products includes the following aspects:

- Increased consumer participation: increased percentage of consumer participation and sustained participation.
- Increased participation of companies and brands.
- Expansion of reuse into glass-sensitive cases of use, e.g., shower gels, and introducing plastic reusable bottles.
- Decreased unit costs of reuse systems to be competitive with single-use packaging.

### Challenge

How can we reduce packaging by establishing return and reuse systems for cosmetics and home care products?

### Challenge providers

[Kerstin Kuchta](#) / Hamburg University of Technology

[SEA ME](#) / Start-up from Hamburg

## A DISTRIBUTED ECIU LIVING LAB: APPROACH TO TACKLE URBAN SUSTAINABILITY TRANSFORMATIONS

Research area: Resilient Communities/Circular Economy

### Background

The ECIU-Urban Transformations Collaboratory (ECIU-UTC) SEED project set out to explore diverse co-creation configurations between sectors of the Quadruple Helix: citizens, municipal stakeholders, private sector organizations and universities/researchers, and, at the same time, identify methods and tools that can help sharing urban transformation experiences between the participating pilot areas and beyond. ECIU-UTC sought to identify a topic and approaches for cross-case learning and engagement and further the research frontier on societal transformations in the ECIU context and the SMART-ER Institute.

### Challenge

How could we increase the exchange of knowledge between the agents of the quadruple helix in order to realize sustainable urban transformations?

### Challenge providers

[Tina-Simone Neset](#) / Linköping University

[K. Kourkoutas](#) / Universitat Autònoma de Barcelona

[B. Saez Tajafuerte](#) / Universitat Autònoma de Barcelona

[P. Valdivia](#) / Universitat Autònoma de Barcelona

[A. Riel Muller](#) / University of Stavanger

[K. Lindland](#) / University of Stavanger

[F. Hernández Palacio](#) / University of Stavanger

[Kristin Kverneland](#) / Smartbyen Stavanger

[Poppy Kalesi](#) / Rogaland fylkeskommune

[V. Junjan](#) / Tampere University

[W. Kuipers](#) / Tampere University

[A. Rijnhart](#) / Municipality Enschede

[V. Angelakis](#) / Linköping University

[S. Malmgren](#) / Rogaland fylkeskommune

[H. Ødegaard](#) / Stavanger Municipality

## TOWARDS SUSTAINABLE AND RESILIENT SMART INDUSTRIAL PARKS

Research area: Resilient Communities

### Background

Industrial and logistic parks are traditionally envisioned as zoned and planned spaces with companies causing negative social and environmental impact including pollution, greenhouse gas emissions, and over-use of resources. Much has been discussed by policy-makers on how to create eco-industrial Parks in sites with large textile, chemical or metal industries lacking real needs of SMEs, representing 99% of all business in the EU.

UPIC, as a private stakeholder aware of SMEs industries and industrial parks requirements and fully committed with 2030 Agenda, aims to design a true eco-industrial modelling framework to be implemented in three European parks mostly occupied by SMEs.

### Challenge

How could we create a comprehensive model where researchers work side-by-side with industrial parks associations by identifying the real needs and providing cost-efficient short, medium and long-term solutions with the aim of achieving true eco-industrial parks.

### Challenge providers

[Sílvia Solanellas](#) / Union of Industrial Parks of Catalonia

[Xavier Gabarrell i Durany](#) / Universitat Autònoma de Barcelona

[Victor Neto](#) / Centre for Mechanical Technology and Automation (TEMA), Aveiro University

## BARRIERS AND OPPORTUNITIES TOWARDS 15-MINUTE CITIES IN URBAN CORES AND OUTSKIRTS

Research area: Transport and Mobility

### Background

The 15-minute city concept, proposed by Carlos Moreno in 2015 (Moreno et al., 2021), targets to provide 'enhanced' accessibility to all essential services and daily needs for the whole population by using active travel modes, and, as a consequence, to improve sustainability, liveability, and the overall health of the public. However, there are major knowledge gaps in finding successful pathways for the implementation of the 15-minute city as a planning concept to achieve a sustainable and liveable urban transition, not only in the urban cores but also in the urban outskirts.

### Challenge

How can we know the barriers and opportunities regarding the transition towards a 15-minute city, particularly in the urban outskirts and neighbourhoods which have a lower life expectancy, lower income, high immigrant share, and higher car usage?

### Challenge providers

[M. Baran Ulak](#) / University of Twente

[Anna Grigolon](#) / University of Twente

[Karst T. Geurs](#) / University of Twente

[Lars Bodum](#) / Aalborg University

[Andrea Hernandez](#) / Aalborg University

[Tom Børsen](#) / Aalborg University

## MISSION CITIES: 100 CLIMATE-NEUTRAL AND SMART CITIES BY 2030

Research area: Resilient Communities, Transport & Mobility, Circular economy, Energy & Sustainability

### Background

Six cities in which ECIU Institutions are located (Barcelona, Dublin, Lyon, Łódź, Stavanger, and Tampere) have been selected by the EC as Climate-neutral and Smart cities. These cities have common challenges (i.e., Mobility & Transport, Renewable Energy Production and consumption, Waste management, Circular economy, Resilience) that could be better tackled in a trans-regional approach. ECIU has started to facilitate networking with and among these cities and to pilot new collaboration actions. During this session, we'll brainstorm about potential opportunities in the funding field of Horizon Europe. The session is open to other cities that are not necessarily "mission ones", but that have similar challenges.

### Challenge

How can we cooperate towards climate-neutral smart cities in Europe?

### Challenge providers

[Fiona Hazell](#) / ECIU University

[Laura Paternoster](#) / ECIU University

[Ramon Canal](#) / Barcelona City Council

[Anders Riel Muller](#) / University of Stavanger

## WHERE EDUCATION AND RESEARCH (CAN) MEET

Research area: Resilient Communities, Transport & Mobility, Circular Economy, Energy & Sustainability

### Background

How Educational Research and Innovation are being developed among the ECIU members? In this session, after a general introduction about the substantial impact of ECIU University in the educational setting of their members, several European research projects in learning, teaching, and others educational fields will be presented by researchers from ECIU members.

### Challenge

How could we capitalize the ECIU university experience to develop a significant educational research in our own universities?

### Challenge providers

[Andrea Brose](#) / ECIU University

[Myra Ronzoni](#) / Universitat Autònoma de Barcelona

[Dorothea Ellinger](#) / University of Hamburg





**Abstracts of  
Posters**

## INFRASTRUCTURE OF PUBLIC SPACES THROUGH PARTICIPATORY METHODS AND THE USE OF ICTS

Sergio Alvarado Vazquez<sup>1</sup>, Ana Mafalda Madureira<sup>1</sup>, Frank O. Ostermann<sup>1</sup>,  
Andreas Hartmann<sup>2</sup>, Javier Estupiñán<sup>3</sup> and Karin Pfeffer<sup>3</sup>

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<sup>2</sup> Faculty of Engineering Technology, University of Twente, 7500 AR, Enschede, Netherlands

<sup>3</sup> Electrical Engineering Mathematics and Computer Science, University of Twente, 7522 NB, Enschede, Netherlands

### Abstract

Worldwide, there is a challenge in articulating the needs and aspirations of local residents in planning, designing and managing public spaces and considering their input in the decision-making processes. The use of ICTs in social participation has proven helpful for researchers and local governments to enhance the discussion with the local residents and decision-makers in participatory setups. However, in countries with emergent economies, the use of technology for data collection processes still requires more research and development. This study explores the use of the digital participatory platform called *AMACHAN* which allowed us to understand the challenges and opportunities of using a tool that could be used for future decision-making. The tool was designed and developed for the case of Mexico and applied to local residents to evaluate the quality of six public spaces. We observed that, while the tested platform allowed collecting the relevant information, challenges regarding the needs for the residents' technical knowledge and access to the use of digital participatory platforms by government practitioners are still present, external factors such as the lack of interest or time to participate was also evidenced. Our research provides insights into the potential adoption of such digital platforms as *AMACHAN* in Mexico and into future projects in the Netherlands.

**Keywords:** digital tools, social participation, infrastructure, public space

## CIRCULARITY IN INDUSTRIAL WASTEWATER TREATMENT: VALORISATION OF METALLURGIC WASTE AS CATALYST OF FENTON PROCESS

João Peres Ribeiro<sup>1</sup>, Luana Sarinho<sup>1</sup>, Márcia C. Neves<sup>2</sup>, Maria Isabel Nunes<sup>1</sup>

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<sup>2</sup> CICECO – Aveiro Institute of Materials, Department of Chemistry, University of Aveiro, 3810-193, Aveiro, Portugal

### Abstract

In this work, residual iron dust (RID) from the metallurgic industry was successfully used as Fenton catalyst in the treatment of pulp bleaching wastewater. The focus was put on the removal of adsorbable organic halides (AOX) by a circular solution based on a waste-derived catalyst. The behaviour of RID as an iron source was firstly assessed by performing leaching tests at various RID:wastewater ratios and contact times. Afterwards, RID-catalysed Fenton process was conducted to maximise the removal of AOX from wastewater. Reusability of RID was assessed with a simple collect-and-reuse methodology, without any modification. The results showed that this novel Fenton-type process may yield high removal of AOX under lower consumption of chemicals. The reaction in the bulk solution was the main pathway of AOX removal, given that the low surface area and porosity of the material did not allow for a high contribution of surface reaction to the overall performance. Moreover, AOX removal was similar over two consecutive treatment cycles, with Fenton process being responsible for 56.7–62.1% removal of AOX from the wastewater, and the leaching step adding further 11.4–13.2% removal. This work presented a novel, circular solution based on a low-cost waste-derived catalyst, thereby advancing the knowledge needed to foster the industrial application of such technologies.

**Keywords:** heterogeneous catalysis, pulp bleaching wastewater, AOX

## THE CHALLENGES OF FUTURE LITERACY: ANTICIPATING THE NEEDS OF EVER-CHANGING COMMUNITIES

Mario Giagnorio<sup>1</sup>

<sup>1</sup> *Scuola di Studi Internazionali, Università di Trento, Via Calepina, 14, 38122, Trento, Italy*

### Abstract

This poster presents the Challenge-based Learning (CBL) activity called *Hitchhikers' guides, Virtual Charons, and the Future of Cultural Objects*, organised by the University of Trento in the 2022 Fall Term. The aim of the Challenge was to increase the participants' Futures Literacy, i.e., the capacity to imagine the future appropriately and to act in accordance with the results of analyses of trends, risks, and unforeseen events.

The Challenge required the participants to create a scenario for a public small-sized ethnographic museum, by anticipating the demands of prospective visitors in the year 2050. The participants adopted the Futures Wheels method for futuristic analysis. The participants had to explore the convergence of four megatrends through their primary (immediate), secondary (less predictable), and tertiary (most remote) consequences. The megatrends explored were: the use of artificial intelligence in education; increasing energy consumption; ageing population; common taxation schemes in the European Union.

The Challenge's outcomes suggest that Futures Literacy is a valid tool to reflect on societal transformations in an innovative fashion, meeting the objectives of the ECIU. The participants envisioned museums as institutions engaged with their communities and as spaces for cross-cultural and intergenerational activities, balancing virtual and in-person services in the light of less reliable energy sources. At the same time, the participants developed awareness about psychological biases, e.g., the expected continuity between the present and the future events, and their impact on decision-making.

**Keywords:** futures literacy, urban futures, social health, community engagement

## CHANGING TRAVEL MODES: HOW HAS COVID-19 IMPACTED TRANSPORT MODE CHOICE IN IRELAND?

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<sup>1</sup> *Dublin City University, St. Patrick's Campus, Drumcondra, Dublin 9, Ireland*

### Abstract

Sudden and wide-ranging behaviour changes were introduced in Ireland following the COVID-19 pandemic. These temporary emergency measures have had both positive and negative impacts on the citizens in their attempts to limit the spread of disease. If Ireland is to meet international climate change obligations and a 51% reduction of transport emissions by 2030, a transformative approach to transport is required to ensure that significant and sustained reductions in transport emissions are achieved. The transformative potential of the sector is evident in reductions of Ireland's transport emissions by 17% in 2020 following COVID-19 [1]. Transport emissions have risen by 6% in 2022 [2], and thus a greater effort is needed to ensure that these reductions are sustained. The transformation of the transport sector is widely recognised as essential if national climate change commitments are to be achieved. These transformations include large scale modal shifts to public and active travel, a significant decline in the private car ownership and sustained remote working. An online survey conducted in 2022 has identified changes in the travel behaviours of Irish people. These changes include increased travel for recreational activities and decreased travel for work. The next phase of the research will identify why these changes have occurred.

**Keywords:** transport behaviours, mode choice, active travel, COVID-19, climate change, Ireland

## DESIGNING FOR SUSTAINABILITY AND SAFETY IN URBAN MICRO-MOBILITY: A NOVEL HELMET CONCEPT

Gabriel Serra<sup>1,3</sup>, Fábio Fernandes<sup>1,3</sup>, Ricardo de Sousa<sup>1,3</sup>, Eduardo Noronha<sup>2</sup>

<sup>1</sup> TEMA – Centre for Mechanical Technology and Automation, Department of Mechanical Engineering, University of Aveiro, Campus de Santiago, 3810-193, Aveiro, Portugal

<sup>2</sup> ID+ – Investigation Institute in Design, Media and Culture, University of Aveiro, Campus de Santiago, 3810-193, Aveiro, Portugal

<sup>3</sup> LASI – Intelligent Systems Associate Laboratory, Portugal

### Abstract

Recent years have seen a significant increase in urban mobility with the rise of micro-mobility sharing services. The emergence of e-scooters and e-bikes has brought about a revolution in the urban landscape worldwide. However, this transformation has also led to a worrisome increase in severe accidents associated with these new modes of transportation. Contributing to this trend are the inability of governments to swiftly adapt regulations to match the evolving mobility trends and the unsuitability of the traditional bicycle helmets for the spontaneous nature of micromobility. Moreover, in an era of resource scarcity and escalating global warming concerns, prioritizing sustainable development has become imperative for the modern economy. Unfortunately, the conventional helmets significantly lack in terms of sustainability, not only due to their predominantly petroleum-derived materials but also because their manufacturing process combines the protective foam and the outer shell, rendering them difficult to recycle or repurpose after disposal. This comprehensive research encompasses the design process, material selection, experimental testing, ergonomics, life cycle assessment, and design for manufacturing of a novel helmet concept for micromobility. The solution can be flattened to the size of a laptop, enabling convenient storage in a backpack. Additionally, it exhibits a 42% lower carbon footprint compared to standard helmets and can be fully disassembled and recycled. This novel concept not only advances aesthetics and functionality but also meets three goals outlined by the UN 2030 agenda for sustainable development, thereby making it a significant milestone for the helmet industry.

**Keywords:** sustainable, micromobility, cork, crashworthiness

## OPEN GOVERNANCE OF ENTREPRENEURIAL ECOSYSTEMS: ENGAGING THE LOCAL COMMUNITY

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<sup>1</sup> GOVCOPP, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal

<sup>2</sup> GOVCOPP, DEGEIT, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193, Aveiro, Portugal

### Abstract

This research investigates the interplay between open governance, specifically, local community engagement, and the governance of Entrepreneurial Ecosystems (EEs) within the context of three Portuguese local EEs. By employing a mixed-method approach encompassing fieldwork, interviews, and document analysis, this study underscores the pivotal role of open governance in EE development, thereby highlighting the active participation of local communities across various phases. This engagement significantly influences the success of entrepreneurial activities within the ecosystem, thus enabling tailored strategies and challenging conventional top-down approaches. Nevertheless, notable reliance on local institutions for governance persists, underscoring the ongoing imperative to enhance citizen engagement and accountability in EE strategies, particularly during consolidation phases.

**Keywords:** open governance, entrepreneurial ecosystems, local development, community

## INTERACTION STUDY BETWEEN SOIL PROPERTIES AND LIQUEFACTION POTENTIAL OF WIND TURBINE FOUNDATIONS

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<sup>1</sup> Normandie Univ., INSA Rouen Normandie, Laboratoire de Mécanique de Normandie, 76801, Saint-Etienne du Rouvray, France

<sup>2</sup> Normandie Université, UNIHAVRE, Laboratoire Ondes et Milieux Complexes, CNRS UMR 6294, Le Havre, France

<sup>3</sup> Thai Nguyen University of Technology, Faculty of Civil Engineering and Environment, Thai Nguyen province, Vietnam

### Abstract

Soil liquefaction is a well-known phenomenon that can cause significant harm. In recent times, the European region has witnessed a rapid escalation in the scale of renewable energy generation, with particular emphasis on harnessing wind energy along coastal zones. The intricate task of generating renewable energy necessitates the establishment of civil engineering structures that exhibit unwavering stability and optimal efficiency. This pursuit takes on added significance due to the imperative of constructing robust wind energy systems that can withstand the potential challenges posed by liquefaction. In the light of this, a full-scale comprehension of the factors exerting influence on the liquefaction potential assumes paramount importance for the meticulous design of dependable and resilient wind energy systems. This paper presents an exhaustive research endeavour that synergistically combines numerical simulations and experimental tests to meticulously dissect the intricate interplay between the soil properties and the potential for liquefaction. In the realm of numerical simulations, the *NorSand* model assumes a central role due to adeptly capturing the underlying mechanisms. Complementary to this, the empirical facet of the study centers around isotropic undrained triaxial tests, enabling a detailed exploration of the phenomenon. The ensuing findings illuminate an intimate nexus between soil saturation, relative density, effective confining stress, and the potentiality for soil liquefaction. To comprehensively grasp the combined impact of these three vital factors on soil liquefaction, the study utilises the orthogonal experimental method. This approach leads to the creation of a sophisticated 3-D model that skilfully illustrates the intricate relationships governing the soil liquefaction potential and the trio of influencing factors.

**Keywords:** soil liquefaction, wind energy, *NorSand* model, isotropic undrained triaxial tests, soil properties, orthogonal experimental method, 3-D model.

## STATISTICAL STUDY AT EUROPEAN CITIES SCALE FOR CHARACTERIZATION AND REPLICATION OF INTEGRATED BUILDING RENOVATION SERVICES

L. Estay<sup>1</sup>, L. De Carvalho<sup>1</sup>, M. Bonhomme<sup>1</sup>, C. Oms<sup>1</sup>, S. Ginestet<sup>1</sup>

<sup>1</sup> LMDC, Université de Toulouse, INSA, UPS

### Abstract

This work focuses on the determination of criteria for identifying groups of territories that may have similar needs or issues in terms of renovation strategies. The final objective is the replication of the Toulouse integrated renovation systems (one-stop shop) across Europe.

To achieve this, the first step was to identify, by using a statistical study, the urban demographic and climatic indicators that influence the rate of housing renovation on a European scale. We observed correlations with construction dates, renovation rates, and the type of the final energy in use. There are also strong correlations between the rate of urbanisation and the specific energy use. This study also revealed the impact of thermal renovation on air-conditioning consumption.

The most relevant indicators were integrated with the indicators already selected from the bibliography to identify cities where the Toulouse OSS could be replicated. 630 European cities were compared based on various criteria including population demographics, climatic conditions, governance, potential CO<sub>2</sub> savings, and urbanization, with the objective to identify the cities which are most similar to Toulouse. Cities that exhibit the greatest similarity are likely to share the same one-stop-shop models, face similar challenges, and have comparable solutions. By clustering them, we have identified cities with similar renovation support issues.

**Keywords:** renovation building strategies, one-stop-shop replication.

## TREATMENT OF SALT-DERIVED BRINE BY ELECTROCOAGULATION PROCESS FOLLOWED BY CORROSION EVALUATION FOR FUTURE APPLICATIONS

L. Sarinho<sup>1,2</sup>; P. Carvalho<sup>2</sup>; A. C. Bastos<sup>3</sup>; J. P. Ribeiro<sup>1</sup>, C. Marques<sup>1</sup>, M. I. Nunes<sup>1</sup>

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### Abstract

In tannery industries, prior to tanning, hides are preserved (the curing stage) by applying 40–50% of common salt (NaCl), based on the fresh weight of the hide. At the same time, significant amounts of brines are consumed in several other industrial processes, namely, in tannery, textile, food processing and petrochemical industries. In this work, the reclamation of this waste was achieved through iron-driven electrocoagulation of salt-derived brine (SdB) using iron electrodes. A current intensity of 2.9 A was applied for 16 minutes, yielding 88% removal of the total organic carbon. Given that NaCl is highly corrosive to metal structures, this work investigated the corrosion resistance of different metals and alloys (aluminium, brass, carbon-steel, copper, AISI 304L, and AISI 316L stainless steels) when exposed to SdB. The corrosion resistance was evaluated by using various electrochemical techniques, including polarisation curves and electrochemical impedance spectroscopy. These measurements were made after immersing the metallic alloys in SdB for one hour. The corrosion resistances of the six metals and alloys, ranked from the highest to the lowest, were as follows: AISI 316L > AISI 304 > aluminium > carbon-steel > brass > copper. This research provides valuable insights for future pilot-scale researchers, improving the circularity of the tannery industry and enhancing their competitiveness against conventional treatments.

**Keywords:** circularity, contaminated salt, electrochemical treatment, metallic alloys.

## AGRICULTURAL SERIES-HYBRID DRIVE EFFICIENCY MODELING BASED ON EXPERIMENTAL DATA

Ugnė Koletė Medževėpytė<sup>1</sup>; Rolandas Makaras<sup>1</sup>, Algirdas Laskys<sup>1</sup>

<sup>1</sup> Kaunas University of Technology, Studentų 56, LT-51424, Kaunas, Lithuania

### Abstract

Greenhouse gas reduction in agriculture has not yet reached its potential, thus suggestions are increasing on how to achieve that. Electrification of agricultural vehicles is one of these options. This research focuses on a series-hybrid drive application for heavy-duty agricultural machine efficiency increase. Efficiency studies are executed by using physical modeling. The physical model is a tool to compare different setups of the investigated vehicle without requiring huge resources. For this case study, two versions of a heavy-duty agricultural vehicle are used. One is a non-modified four-wheel drive vehicle with an internal combustion engine and a continuously variable transmission, whereas the other one is the same chassis with a similarly powered series hybrid drive. Vehicle models are based on the existing vehicle data that was gathered during experimental runs. The same runs were used to collect environment-based data to complete model verification and its correspondence to real resistance. Agricultural transport loads and work templates differ from the conventional road transport. To evaluate the agricultural hybrid vehicle, road cycles cannot be applied. For this study, a methodology which has previously been introduced by the author is used. By applying three different types of work stages, a typical agricultural vehicle work cycle is generated. By using this cycle in a physical model based on the collected data, scenarios for possible fuel consumption reduction are determined.

**Keywords:** agricultural hybrid, series hybrid, off-road transportation, heavy-duty vehicle.

## TASTE THE DIFFERENCE: A JOURNEY INTO *SOLANUM LYCOPERSICUM* VARIETIES AND FERTILIZATIONS

G. Evangelista<sup>1</sup>, P. Tonini<sup>1</sup>; F. Orsini<sup>3</sup>; G. Villalba<sup>1,2</sup>, X. Gabarrell<sup>1,2</sup>

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<sup>3</sup> *University of Bologna, Department of Agricultural and Food Sciences, Alma Mater Studiorum, viale Fanin 44, 40127, Bologna, Italy*

### Abstract

Tomato is one of the most popular and consumed crops worldwide, and its cultivation with hydroponic techniques is widely spread. However, most producers prefer high-yielding breeds to the local ones, and mostly rely on the use of mineral fertilizers, which can cause serious environmental damage. Struvite, a wastewater by-product, is a slow-releasing fertilizer that can provide the crops the right dose of phosphorus, magnesium and ammonia. In this study, we evaluated the consumers' preferences regarding two tomato varieties and fertilization, by focusing on the overall taste and the texture of the samples. The chosen varieties were Arawak, a high-yielding breed developed by *Syngenta Group*, and Montgrí, a local variety from Catalonia. Half of the plants received complete mineral fertilization while, for the other half, the doses of phosphorus, magnesium, and ammonium were replaced with 100 g of struvite grains. A survey was conducted in which 141 people participated. It featured four distinct tomato samples: AC, AS, MC and MS (A = Arawak; M = Montgrí; C = regular fertilization; S = struvite fertilization). The participants were asked to indicate their preferences regarding the texture and the taste on a five-level Likert scale (1: very bad; 5: very good). Significant differences were found between the taste of MC tomatoes, with samples AC and AS that were preferred by the respondents while, regarding the texture, statistical differences were found between the samples of MC and MS, with the participants who preferred the sample fertilized with struvite. These findings show, based on the consumers' preferences, the potential of the local varieties and struvite as a fertilizer for hydroponic tomato cultivation, thereby offering comparable benefits to the conventional counterparts while promoting sustainable solutions.

**Keywords:** tomato, struvite, local varieties, consumers' preferences.

## DIFFUSED LIGHT CONCENTRATION FOR ENHANCED SOLAR ENERGY YIELD

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### Abstract

Solar panels only generate up to 25% of their normal output on an overcast day. Light scattered by the clouds, referred to as diffuse, is less concentrated than direct irradiation present in clear-sky conditions. Since the electrical power demand is arguably higher on a cloudy day, inefficient collection of diffuse light aggravates the issues related to power congestion. To circumvent this, a larger amount of diffuse light is to be harvested, either by installing more solar panels, or by concentrating the light. Adding more solar panels is an expensive and space-hungry solution. Therefore, our focus lies on the concentration of diffuse light. In this work, we showcase a novel photonic device that can effectively concentrate and collimate diffuse light onto solar panels. The traditional luminescent solar concentrator architecture is entirely revisited to decrease lossy events that deteriorate device efficiency. The solution proposed, named the free-space luminescent solar concentrator (FSLSC), combines the concepts of luminophore down-conversion, photon recycling and spectro-angular emission control. A



prototype of the device was fabricated and showed an 18% concentration enhancement in comparison to a white Lambertian reflector. Current research efforts aim at increasing the concentration efficiency of the device by investigating state-of-the-art perovskite luminophores, optimising the spectro-angular reflection coating, and simulating the device performance under realistic conditions.

**Keywords:** diffused light concentration, photonic metamaterials, solar energy, spectro-angular emission.

## STRATEGIES TO IMPROVE PRODUCER GAS QUALITY FROM RESIDUAL FOREST BIOMASS GASIFICATION

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### Abstract

Biomass gasification is a relevant option to produce gaseous fuel, however, it faces several barriers regarding its quality for energy applications. Thus, in this study, air-steam and O<sub>2</sub>-enriched air mixtures were used as gasification agents of residual biomass from eucalyptus to get producer gas of high quality. The steam addition promoted an increase in CO<sub>2</sub> and H<sub>2</sub> concentrations, whilst decreasing the CO and CH<sub>4</sub> concentrations. The steam addition had no evident impact on the lower heating value of the dry producer gas, but showed a positive effect on the producer gas yield and the H<sub>2</sub>:CO molar ratio, by attaining the values of the latter up to 1.6 mol<sub>H<sub>2</sub></sub>·mol<sup>-1</sup><sub>CO</sub>. An increase in the O<sub>2</sub> concentration in the gasification agent ( $\phi$ ) promoted an increase in all combustible species and CO<sub>2</sub> concentrations. The lower heating value of the dry producer gas underwent an increase of 57%, reaching a value of 7.5 MJ·Nm<sup>-3</sup><sub>dry gas</sub> when the  $\phi$  value increased from 20 to 40%vol.<sub>O<sub>2</sub>, dry GA</sub>. The producer gas yield had a significant decrease (33%) with the  $\phi$  increase. This work shows that the addition of steam or O<sub>2</sub> during air gasification of residual forest biomass improves the producer gas quality, thereby overcoming some of the barriers found in the conventional air gasification.

**Keywords:** bubbling fluidised bed gasifier, hydrogen, H<sub>2</sub>:CO molar ratio, lower heating value.

## AN ECIU MICROMODULE ON GLOBAL WARMING, RENEWABLE ENERGY, AND DECARBONIZATION

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### Abstract

A ‘micromodule’ on Global Warming, Renewable Energy, and Decarbonization has been offered several times via Universidade de Aveiro, Portugal, participation in the ECIU. The course begins with examination of global energy sources (petroleum, natural gas, coal, renewables, and nuclear) matched to the energy consuming sectors (transportation, industrial, residential and commercial, and electric power). A realistic assessment is provided in terms of where we are compared to where we need to go. Technologies for reducing net CO<sub>2</sub> emissions can be placed into three categories: 1) those that reduce ‘future’ emissions from continued use of fossil fuels; 2) those that can remove CO<sub>2</sub> ‘already’ in the air; and 3) renewable technologies that provide ‘no net removal’ of CO<sub>2</sub>. A windmill built today will reduce emissions from the generation of an equivalent amount of electricity from a natural gas or coal fired power plant in the future, but will not reduce CO<sub>2</sub> already in the air. Since complete elimination of fossil fuels will not be possible while supplying the energy needs of a growing population, technologies in the second category are needed. Details of a full list of technologies in all categories are discussed, including methodology, the current capacity, growth, limits to their contribution to the total energy, advantages, and challenges. Care must be taken to do a proper life cycle analysis for the technologies



claimed to be renewable. For example, bioethanol from corn is claimed to be renewable. However, the energy required to separate ethanol from water and run the rest of the process makes it highly energy inefficient, and thus, not truly renewable. When the entire carbon plant is taken as the basis, bioethanol is shown to be highly carbon inefficient. Resource requirements must also be considered. Forty percent of the US corn crop is devoted to bioethanol. However, it satisfies only 10% of the US gasoline pool.

**Keywords:** ECIU, global warming, renewable energy, decarbonization, carbon dioxide, bioethanol.

## PARTICIPATORY APPROACH FOR SUSTAINABLE CITY-REGION FOOD SYSTEMS: A CASE STUDY OF A PERI-URBAN HORTICULTURE PROJECT

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### Abstract

This poster highlights the participatory process used in co-designing the *Can Gambus* pilot project, located within Sabadell. *Can Gambus*, managed by Sabadell City Council, serves as a testing ground for innovative agricultural practices, economic viability, and the multifunctionality of agriculture. Collaborating with FoodE's local stakeholder advisory board, consisting of public representatives, researchers, and innovative CRFS SMEs, this initiative aimed to identify key activities with the highest relevance scores. This study offers valuable insights into the participatory process for sustainable urban agriculture initiatives, thereby providing a framework for enhancing food system sustainability in urban settings.

**Keywords:** city-region food system, peri-urban, horticulture, participatory approach, sustainability.

## UNIVERSITIES AS REGIONAL CHANGE ARCHITECTS

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### Abstract

This study explores the potential of universities as proactive agents driving and orchestrating innovation in their regions rather than simply reacting to the regional needs. Various frameworks recognise universities as vital components of innovation ecosystems, but understanding the proactive nature of their activities in relation to their regions still remains challenging. To address this, the study employs the *Trinity of Change Agency* framework which identifies three key roles: innovative entrepreneurship, institutional entrepreneurship, and place-based leadership, as agents for transformative change in specific regions.

The research conducted an integrative literature review, encompassing publications in business economics, education sciences, and related fields, which resulted in 819 articles. After rigorous screening, 56 articles were selected and coded according to the qualitative categories relevant to university missions: education, research, and community engagement.

The findings aim to develop an updated framework of change agency tailored to the higher education sector, shedding light on how universities actively drive regional innovation. This insight can be valuable for university management to identify strengths and enhance their innovation strategies, and for policymakers to refine innovation policies related to higher education institutions.

**Keywords:** universities, change, agency, region, innovation ecosystem.

## LINKING AIR POLLUTION, GREEN INITIATIVES, AND HUMAN HEALTH: WHERE ARE WE?

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### Abstract

Air pollution is a major health concern. To tackle this issue, the European Union has set a goal of zero pollution for air by 2050. To this end, a clean air policy combined with various measures has been implemented, namely, the increasing use of trees in cities, low-emission vehicles, and renewable energy sources. Despite these efforts, the following questions remain: 1) Have green initiatives, such as trees and low-emission vehicles, been effective in alleviating air pollution exposure hotspots in cities, with consequent health improvements; 2) What is the potential of various air pollutants for cell damage, and how does this relate to health effects in the current scenario of emission sources; and 3) Do urban planners and policymakers possess adequate data to implement green strategies for an improved air quality? This cutting-edge CHALLENGE proposal aims to develop an innovative multidisciplinary and multi-scale framework to address these questions and gain an in-depth insight on the link between air pollution, green initiatives, and human health. By pursuing holistic understanding of these links, the outcomes will be key for enabling policymakers and urban planners to make informed decisions. By assessing the link between green initiatives and human health via air pollution mitigation, it will be possible to assess whether our current understanding of such actions is sufficient to advise their application in practice.

**Keywords:** healthy environment, healthy society, air pollution, citizen participation.

## CIRCULAR FASHION: DESIGNING CLOTHES FOR CLOSED-LOOP RECYCLING

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### Abstract

The current state of the fashion industry is urging social and environmental transitions, described as long-term, multi-dimensional and fundamental structural transformation processes, leading to more sustainable production and consumption modes of the established socio-technical and socio-ecological systems. Such changes are necessary because the fashion and textiles industry is considered one of the largest contributors to greenhouse gas emissions. As a significant contributor to climate change, the fashion industry needs to act *now* to cut its GHG emissions. There is an emerging consensus that transitioning to a circular economy is a win-win intervention, reducing the environmental damage whilst creating value for the fashion ecosystem. The proposed research investigates how the principles of circular economy can be implemented in the design stage of the fashion industry and gives comparative analysis of the potential and challenges of reactive and proactive approaches to the fashion product design.

**Keywords:** sustainable fashion, circular design, circular economy, fashion design.

## A SMART EDUCATION FOR A SMART CITY

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### Abstract

The Challenge addresses the evolving educational needs driven by emerging industries and smart city aspirations. Ensuring preparedness for industry expansion, the challenge emphasises adept teachers equipped with skills for effective smart education. The Teacher Competence for SMART Education (TCS) framework is pivotal, involving teachers adapting beliefs, acquiring knowledge, and recognising the imperatives of educational change. Within the European Higher Education Area, ECIU focuses on competencies to reshape universities. This initiative aligns challenge-based teaching with ECIU University goals, thus fostering skill development among teachers, researchers, and non-academic staff. The challenge, aimed at crafting a Capacity Development Model for Smart Education within Smart Cities, echoes these principles. It seeks to enhance skills, align competencies, and cultivate collaboration while shaping an incentives-driven environment. The challenge session employs guided brainstorming, aiming for comprehensive understanding and solutions synthesis. The proposed thematic challenge on *Smart Education for a Smart City* aims to foster collaboration, knowledge sharing, and networking among experts, which resonates with ECIU's overarching mission.

**Keywords:** citizen participation, community engagement, smart communities, social capital.

## DIGITAL TWIN FOR COMPARATIVE ANALYSIS OF BUILDINGS' THERMAL DYNAMICS MODELS

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### Abstract

Heating energy accounts for a major share of the total energy consumed in buildings. Various strategies are now available to reduce energy consumption. However, choosing the right strategy requires good understanding of the thermal behaviour of the buildings. Thus, it is common that decisions for heating energy optimisation are made based on approximations rather than real data. The commonly used simulation (white box) models based on heat transfer laws include many parameters and require a great deal of expertise. Meanwhile, purely data-driven (black box) models have very limited reproducibility. As an alternative, grey box modelling emerged which takes a hybrid approach using physics-based equations with parameters tuned by data. Grey box modelling offers a more reproducible way to model building thermal dynamics with smaller datasets and lower resource requirements. Still, due to user influence, similar buildings can behave very differently. Therefore, this study introduces an interface which combines static and dynamic building data in real time, thus creating the digital twins of buildings. It allows the user to automatically fit the grey box model for a selected building and compare it to its peers. Peer-to-peer comparison with access to additional data can allow stakeholders to better understand the thermal performance of the building and make more informed decisions when choosing an energy optimisation strategy.

**Keywords:** thermal inertia, industry 4.0, data integration, internet of things.

## RESILIENT COMMUNITIES IN SCHOOLYARDS, THE EXAMPLE OF ROTTERDAM

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### Abstract

There are various alternatives to tackle the climate crisis in urban areas which can lead to urban transition towards sustainability. The use of a nature-based solution is one of the alternatives that not only deals with the climate, but also societal problems in urban areas. Schoolyards are spaces in the city that can be seen as public infrastructure which works for its direct users and the surrounding community. Green schoolyards benefit children, thus increasing their health, well-being, and social life. However, implementing nature in schoolyards deals with different actors with different perceptions of the safety and quality of the space; there are divergent perspectives regarding the safety of schoolyards as open spaces. Also, there is a lack of evidence of how much NbS in schoolyards is changing the local microclimate. So, the main objective of this presentation is to demonstrate the mixed-method approach in order to investigate the necessary conditions for NbS to create a climate shelter in schoolyards as an innovative strategy for urban transition. To do so, we shall use systematic literature review to describe urban transition and access, and to determine which NbS factors are related to safety perceptions that can contribute to urban transition. Second, we shall examine the quality of spaces and the safety perception of users about the NbS present in schoolyards what regards using Fuzzy cognitive mapping. Third, we shall use spatial analysis to visualise the connection between the perceptions and the socio-economic indices along with statistical analysis in order to assess the correlation between the quality and safety perception and the socio-economic indices in different neighbourhoods. Then, with the green schoolyards assessment tool and microclimate measurements, we shall evaluate the quantity of nature and grey in schoolyards and apprise the NbS effect in the local microclimate. The final research is expected to: (1) contribute to the scientific knowledge on the link between NbS and urban transition; (2) help improve the formulation of more accurate guidelines for green schoolyards, while taking into consideration the socio-economic differences across the neighbourhood; and (3) have an indication for the amount of green intervention and access the benefits that green schoolyards bring to the local microclimate.

**Keywords:** nature-based solutions, schoolyards, urban transition.

## INTELLIGENT METHODOLOGIES FOR DIGITAL AND SUSTAINABLE MANUFACTURING IN MACHINING

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### Abstract

The transition to digital machining is fundamental for controlling the surface integrity of the components, and for efficient management of resources (energy, metalworking (MWFs), cutting tools). The digitisation of the machining process allows such tools as artificial intelligence, advanced statistics, and digital twins to be used for machinability prediction, tool design, and cost reduction. This study employed hybrid methods including finite element analysis, digital image processing (DIP), sensor signal analysis, and statistical and intelligent modelling to study the machining of biomedical titanium alloys. The main focus of this research was to create robust strategies, based on process digitisation, to understand the machinability of two biomedical Ti alloys,  $Ti_6Al_4V$  and  $Ti_6Al_7Nb$ . The DIP technique based on correlative microscopy (CM) has been developed to evaluate how the cutting parameters influence the topography and microstructure of Ti alloys since it shows modifications in the distribution of chemical elements which are present on the surfaces of machined materials in favoured locations related to the machining topography patterns [1]. To replace the traditional manual methods prone to human error, lack of standards and low sampling rates, an automated DIP algorithm was created for extracting

the morphological aspects of saw-tooth chips [2]. This algorithm was then employed to validate the modelling strategies in MWFs-assisted digital twins created to facilitate the industrial transition from harmful cooling practices, such as flooded machining, to sustainable methods such as minimum quantity lubrication (MQL) [3]. These developed strategies belong to the digital transformation which promotes an enhancement of productivity and sustainability in the machining sector.

**Keywords:** machining of Ti alloys, digital image processing (DIP), finite element analysis (FEA), modelling and optimization.

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## HOW INSTITUTIONS SHAPE CIRCULAR SYSTEMS – COMPARATIVE ANALYSIS OF PACKAGE DEPOSIT SYSTEMS IN AUSTRALIA AND FINLAND

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#### Abstract

The transition towards circular economy (CE) is a critical, yet also a highly complex phenomenon, as it requires collaboration between diverse stakeholders who are driven by different institutional rules, norms, and motivations. While a system-level approach is needed to understand CE transitions, extant literature is focused on single systems, such as value chains and business networks, but it does not compare the adoption of one and the same CE solution in different systems. To address this gap, this study examines how different institutional elements shape the adoption of a similar CE solution in different market contexts. We derive empirical insights from a comparative case study which examines the beverage package recycling systems in Finland and Australia. Our findings show how institutional elements can drive or hinder the CE-related collaboration in these systems. We contribute to marketing, CE, and sustainability literatures by illustrating how institutional elements shape the adoption of similar CE solutions in different institutional systems.

**Keywords:** circular economy, institutional theory, regulation, norm, cultural-cognitive, case study.

## USE OF INSECT BREEDING WASTE IN FERTILIZER PRODUCTION

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#### Abstract

The current direction of development is the Green Deal, and its main goal is to create a sustainable, modern economy without harming the environment. In order to avoid the negative effects of intensive farming, various options for sustainable agriculture are often offered, such as partially replacing synthetic fertilizers, or replacing chemical plant protection measures with biological ones [1]. Residues from other agricultural branches can be used as an alternative raw material to produce fertilizers. The current trends in insect breeding, which are gaining wider applicability and legalisation for use in the food industry, also create prerequisites for the development of possibilities for processing waste products. In Lithuania, the cultivation of insects is developing rapidly, which means that the amount of frass will also grow rapidly, so the ways of its use are a highly potential issue. Under laboratory conditions, studies of frass were carried by the company UAB *Divaks* regarding the suitability for fertilizer production [2].

**Keywords:** frass, green deal, fertilizers, waste.

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## EMPLOYING DIGITAL TWIN TECHNOLOGY FOR AUTISM FRIENDLY NAVIGATION INDOORS

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**Abstract**

Universities are hubs for diverse populations, each with its unique needs, aspirations, and challenges. Within this diversity, students with *Autism Spectrum Disorder* (ASD) often face barriers that are invisible to many. Navigating the hustle and bustle of a university campus can be a daunting experience for them, owing to their sensory sensitivities. The noises in the crowded hallways, the flickering of fluorescent lights, or even the unexpected movement of people can be overwhelming. The challenge is further accentuated when navigation systems, designed for the general population, fail to consider the unique experiences and needs of those with ASD. In this poster, we propose a Digital Twin solution of the Polaris building at Dublin City University to help autistic students and visitors to navigate to their desired destination while avoiding crowded or noisy environments, thus enabling an autism friendly navigation. It has been found that using the available technology on digital modelling, IoT sensor streaming and UE (Unreal Engine), is a suitable and flexible methodology for the development of a solution for Indoor Autism Friendly Navigation challenge.

**Keywords:** digital twins, IoT sensors, ASD friendly, indoor navigation.

## CHARACTERISATION OF GLAZED BALCONIES IN FINLAND: PRELIMINARY FINDINGS FROM A LITERATURE REVIEW

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**Abstract**

The recent pandemic highlighted the importance of the quality of housing design to support the needs and well-being of residents but also to create a resilient society that can respond to unpredictability. The study of balconies and their role in the housing design is recent, and they remain understudied and uncharacterised specifically in the case of Finland with its Nordic climate (and its increased high temperatures due to climate change) and the recent trend of glazed enclosures to balconies and extensions of balconies across facades. This research aims to characterise and investigate the performance of glazed balconies in Finland. As such, a literature review revealed that the current design solutions are efficient in reducing the energy consumption and improving the durability of concrete structures. However, the actual use and user preferences of Finnish balconies remain uncharacterised. Hence, a wider national-scale survey is needed to investigate the user perception and preferences.

**Keywords:** balconies, building performance, user perspective, housing design.

## IMPLEMENTING CHALLENGE-BASED LEARNING IN DISTANCE MODE: THE CASE OF ECIU

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### Abstract

In order to innovate study processes, teachers – be it because of bottom-up or top-down reasons – implement new learning methods, such as Challenge-based learning (CBL), and, since the beginning of the global pandemic, it is often done in the distance mode. Since CBL is a relatively new study method, research on its implementation, especially in the distance mode, is still scarce. The present paper shares a part of the results of a study on teachers' activities when implementing Challenge-based learning in the distance mode at various ECIU alliance universities.

**Keywords:** challenge-based learning, CBL, teachers' activity, changes in curriculum.

## ENGAGING WITH THE FUTURE: INTERNATIONAL COOPERATION FOR RESILIENT COMMUNITIES – A NEW CHALLENGE PROPOSAL FOR THE ECIU COMMUNITY

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### Abstract

The future of international cooperation relies on developing new forms of active involvement of EU citizens and institutions, as much as the methods allowing communities to innovate their socio-technical approach to resources and their overall distribution. In the spirit of ECIU collaboration, this short presentation illustrates the proposal of a new challenge aimed at exploring possible scenarios of international cooperation in a changing geopolitical environment, adopting a future-oriented and culturally-informed perspective.

The prompt of the challenge comes from a small NGO working on environmental protection and social inclusion in Italia and Tanzania (mazingira.org). After a long experience in the implementation of SDGs with participatory and community activities, the association searches for innovative ways to involve citizens and institutions. The global economic situation and the evolution of the geopolitical arena stimulate small and medium organizations to situate themselves differently than in the past, both in terms of external accountability and internal goal-setting. Hence, the challenge of working for common global solutions to environmental and social resilience and, specifically, exploring future scenarios of international cooperation.

This specific request of the stakeholder meets the growing demand of students for multiculturalism in higher education and opportunities for practice-based learning activities. It also meets the needs of global enterprises to integrate and develop their production activities according to SDGs and ethically responsible principles.

**Keywords:** resilient communities, futures literacy, cultural change.



## AGROECOLOGICAL LANDSCAPES: PLANNING FOOD AND ENVIRONMENTAL DYNAMICS IN URBAN-RURAL AREAS

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### Abstract

Agriculture and landscape are interconnected, with agriculture shaping and influencing the surrounding landscape through land use, biodiversity, soil quality, and water resources. Conventional agriculture can lead to soil erosion, soil degradation, and water pollution, while environmentally sound and socially beneficial agricultural methods exist. This research explores the integration of Alternative Food Landscapes in Urban Planning as part of Green Infrastructures. It studies the current and past public policies supporting urban agriculture, such as financial incentives, land use changes, or urban agriculture programs. The research focuses on the economic and social impacts of urban agriculture, such as improving the food security, creating jobs, and strengthening community ties. Three case studies are used to explore the development of new policy initiatives in the integration of urban edible landscapes in urban planning. The first case study in Arco, northern Italy, involves allocating abandoned public land to four young aspiring farmers. The second case study in Gothenburg, Sweden, involves the allocation of abandoned public land to citizens with a request to start a farm. The third case study, *Orto Aperto*, in Trento, Italy, assigns abandoned public land to a citizens' association. The study reveals a greater difficulty in finding available land in the two Italian areas due to the mountainous terrain and urbanization in the foot area of the valley.

**Keywords:** edible gardens, green infrastructure, urban agriculture, public good, agroecology.

## FLAX FIBERS AS NEW FILTER FOR METALS REMOVAL FROM RUNOFF WATERS

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### Abstract

Industrial activities and road traffic provoke the release of atmospheric micropollutants into the environment, especially during a rainy event. Because of important soil sealing, spontaneous infiltration of water is inhibited, which leads to the accumulation of micropollutants in runoff waters. Among these pollutants, metals constitute a real menace to the environment and health (Es-Sahbany et al., 2022), and this type of pollution affects the quality of the water released into the environment. The treatment of water with rapid and inexpensive methods, including biomass adsorption, is nowadays an important issue. Today, Europe, and especially France, is the world leader in the production of fiber flax, and, during the production process, some of it becomes unusable. A previous study (Kajeiou et al., 2020) proved that flax fibers can remove  $\text{Cu}^{2+}$ ,  $\text{Pb}^{2+}$  and  $\text{Zn}^{2+}$  ions in high percentages (between 80 and 94% for monometallic solutions, and between 60 and 94% for multi-metals), and that they could be used, in combination with sand, for the development of a natural filtering system. The idea is to extend the system to  $\text{Cd}^{2+}$ ,  $\text{Cr}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Ni}^{2+}$ , and  $\text{Pb}^{2+}$  by conducting competitive and non-competitive batch experiments on flax fibers to study metal ions biosorption performance. The biosorption efficiency is dependent on contact time, metal initial concentration, and flax fibers concentration, and it is measured by ICP-MS. The adsorption behaviour of each metal and of a seven-metal mixture is studied at levels close to those of the real runoff (concentrations in  $\mu\text{g/L}$ ). The biosorption data are fitted with various models in order to determine the kinetics and the sorption process.

**Keywords:** runoff, metals, ICP-MS, kinetic models, isotherm models.



## MANUFACTURING OF ANODE-SUPPORTED THIN FILM ELECTROLYTE MEMBRANES FOR SOLID OXIDE FUEL

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### Abstract

Gadolinium-doped ceria (CGO) has become one of the most commonly used electrolytes in Solid Oxide Fuel Cells (SOFCs). CGO presents itself as a viable substitute to the state-of-the-art zirconia-based electrolytes which typically require higher operation temperatures (i.e., 800–1000 °C). The manufacturing of thin CGO electrolyte films, however, has been a challenge, primarily due to the difficulties in producing fully dense films. Our primary objective is to enhance the manufacturing process for producing compact thin electrolyte films measuring less than 40 μm in thickness. Specifically, our focus lies on optimising the manufacturing of  $(\text{Ce}_{0.90}\text{Gd}_{0.10})\text{O}_{2-d}$  (CGO10) compositions atop porous composite NiO-CGO10 electrode substrates. A concurrent aim was to ensure the uniformity of the NiO-CGO10 composite electrode. Three different methods were tested: spin-coating, screen-printing, and hand-brushing, followed by a sintering step in air. The density and thickness of the films were evaluated by using scanning electron microscopy (SEM) and energy-dispersive spectroscopy (EDS). In all cases, good adhesion of CGO10 electrolyte to NiO-CGO10 composite was observed. Nonetheless, several differences were identified in the microstructure of the produced films. Among the three techniques, spin-coating produced thinner films, of around 9 μm in thickness, although not fully dense. In the case of the screen-printing methodology, thicker but non-uniform films with a 45–80 μm thickness were produced. Finally, the films deposited by paint-brushing were successfully densified, with a thickness of 40–50 μm. Cross-sectional SEM and EDS images showed that these findings may serve as a foundation for further optimization and refinement of the deposition techniques being used.

**Keywords:** Solid Oxide Fuel Cell (SOFC), gadolinium-doped ceria (CGO), electrolyte, electrochemical cell, thin film deposition.

## SAFE AND CIRCULAR BIOFUEL PRODUCTION FROM LIGNOCELLULOSIC BIOMASS

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### Abstract

In the context of transitioning towards a bioeconomic society, valorising local biomass and waste is a suggested approach according to the European bioeconomy strategy. ARBRE is a project exemplifying this strategy which aims to valorise lignocellulosic biomass in Normandy by using green hydrogen derived from wind energy. The process involves obtaining levulinic acid (LA) from the biomass, which is considered a promising building block [1]. By optimising each step of the chain, high-value molecules, such as alkyl levulinates (ALs) and γ-valerolactone (GVL), can be synthesised. These molecules find applications as solvents, additives, and biofuels [2]. The study focuses on LA esterification using various alcohols and employs the Taft equation, a tool predicting the reaction behaviour based on the polar ( $\sigma^*$ ) and steric ( $E_s$ ) effects of alcohol substituents. This approach minimises the experimental testing and reduces costs for ester synthesis. Additionally, the hydrogenation of butyl levulinate into GVL is investigated, focusing on kinetics and risk assessment as the vital steps before scaling up from pilot to industrial production.

The Taft parameters are presented in literature at 25 °C for reactions conducted in excess of alcohol, but there is no information on their dependence (or absence of dependence) on temperature, and for systems conducted in the presence of a single not dangerous solvent [3]. We studied LA esterification by methanol (ML), ethanol (EL), propanol (PL) and butanol (BL) in a batch system across the range of 20–80 °C. A kinetic model has been developed for each, and the kinetic parameter is estimated by using the *Athena Visual Studio* software, while the thermodynamic parameters are determined by using ePC – soft. We confirmed that the kinetics of LA esterification is faster when the alcohol molecule is smaller. Afterwards, re-estimation of ( $\sigma^*$ ) and ( $E_s$ ) takes place.

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## STRATEGIC DEVELOPMENT OF COMPANIES FOR A CIRCULAR ECONOMY: THE PROCESS

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<sup>1</sup>Tampere University

#### Abstract

This research explores how companies can manage their strategic development towards circular economy (CE). Particularly for established companies, pursuing circular business is a demanding and long process which requires strategic development of the company over time. However, neither CE business research, nor the research on the strategic management of business is yet able to effectively guide companies through this complex process due to the lack of empiric success cases and strategic frameworks. The present research addresses these theoretical and practical gaps by discussing the following questions: (i) How can companies develop a circular business strategy (CBS); (ii) How can companies innovate circular business models (CBM) over time; and (iii) How can collaboration support companies in developing a CBS and innovating the related CBMs.

To answer the research questions, a total of 11 empirical circular pioneer case companies are studied in qualitative multiple case and single case study settings in four individual publications. The cases represent established companies that have been proactive in their strategic development for a CE, selected from environmentally-burdensome industries, yet from advanced circular institutional contexts in Finland and Italy. The analysis is processual, and it uses such methods as the critical incident technique.

As its contribution, the present research develops new knowledge and conceptualises a comprehensive process model on the proactive strategic development of established companies towards CE. These theorised insights unveil how the circular business strategy, CBMI, and collaborations for CE interact dynamically over time, and how they can be timely managed in an intertwined way so that to initiate proactive strategic development for CE in already established companies. This research makes multiple contributions to the research on CE as a business paradigm, and offers implications to particularly its streams on environmental and circular business strategies, CBM, and collaboration for CE, builds understanding of company-level CE implementation as a strategic, processual, and temporal issue.

In terms of pragmatic contributions, the findings and the process model advise specifically business and tech managers across industries in terms of what actions to take and when to proactively implement and accelerate

strategic development for circularity, so that not only to survive in disruptive CE transition, but also how to gain competitive advantage as a CE pioneer. Further, the findings also have practical implications for policymakers, other organizations, and consumers, in supporting the companies' efforts to become strategically circular. Finally, the findings support companies in advancing overarching societal sustainability goals in the economic life and the society.

**Keywords:** strategic development, circular economy, circular business strategy, circular business model, sustainability, process approach, qualitative case study.

## PLACING CITIZEN ENGAGEMENT AT THE HEART OF AI RESEARCH AND INNOVATION

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### Abstract

The development and use of Artificial Intelligence (AI) poses complex socio-scientific issues, particularly with regard to ethics and privacy. There is a need to engage communities in research and innovation around the emerging technologies in order to ensure responsible development of AI and leverage its potential for good. We examine two examples of initiatives designed to engage citizens and researchers in dialogue and knowledge exchange around the emerging AI research and innovation: Citizens' Think-Ins on AI in Ireland and open forums on AI prototype experimentation and discussion in Spain. We conclude that there is demonstrable value in such engagement initiatives for citizens and researchers alike to ensure that inclusive, resilient, and sustainable communities thrive in the Age of AI.

**Keywords:** citizen participation, community engagement, smart communities, resilience, artificial intelligence.

## BEYOND PUBLIC ENGAGEMENT: ECIU EMBRACING EMPOWERMENT, INCLUSIVITY, AND EQUITY

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### Abstract

ECIE aims to contribute to making the citizen science (CS) research more inclusive. With the objective to advance the development of citizen science initiatives in and among ECIU universities by focusing on empowerment, inclusion, and equity in research design and implementation, we aim to establish a Community of Practice on citizen social science within the ECIU network, and we will deliver a paper on how to make CS more inclusive.

**Keywords:** health, resilient communities, adaptability, citizen participation, community engagement, equity, social capital.



**SMART-ER**  
**Seed Projects**

## DIGITAL MEDIA NETWORK DOCTORAL EXPERIENCE (DIMENDX)

**RESEARCH AREA** / Resilient Communities

**TYPE OF ACTION** / Blended mobility to create networks

**Coordinator institution** / University of Aveiro, Rui Manuel de Assunção Raposo

**Partner institutions** / Lodz University of Technology, University of Trento, Dublin City University, Linköping University, Fondazione Bruno Kessler

We live in an interconnected society that, due to its rapid pace and volatility, has allowed us to shape our tools and, at the same time, be shaped by those same tools. This sometimes harsh and, commonly, unbalanced reality presents multiple challenges that should be at the core of the work done in education, research and innovation in future thinking higher education institutions and how they can contribute to the design and evaluation of digital services and platforms as tools and solutions for challenges related with SGD11 goals associated with resilient communities. The DIMENDX (Digital Media Network for Doctoral Studies Experiences) project is focused on establishing and promoting transdisciplinary, transnational and transinstitutional advanced doctoral studies in the field of Digital Media with clear concerns with SGD11 goals associated with resilient communities. The work was conducted according to the framework specifically designed for the project, and it enabled the DIMENDX team to map out and kickstart the initial establishment of a network capable of further exploring ECIU University's potential in education, research, innovation and administrative activities within the broad field of Digital Media. The project was able to promote the establishment of a network that has started to foster and increase collaboration in research initiatives as well as joint supervision of PhD students who are expected to contribute to the improvement of UX, Usability and Accessibility of solutions used to reach the goals established by the UN in the context of resilient communities. During the project period, the team worked towards achieving multiple objectives, such as: mapping the group's competencies and resources; designing short, medium and long-term joint strategies and goals in terms of research; creating mobility and collaboration opportunities for researchers, students, teaching and administrative staff; and designing doctoral research topics, training opportunities and transferable skills useful for the ECIU University ecosystem.

The team was surprised to find that, within the ECIU University and directly linked with the field of Digital Media, there are currently around 17 1<sup>st</sup> cycle programs (undergraduate and bachelor's degrees); 17 master's and postgraduate degrees, 9 doctoral programs, and also a set of 15 research units and groups, all teaching or researching overlapping or correlated issues. It was clear that there was a great deal that could be done to build on the intellectual capital of the ECIU University in the field of Digital Media and how it can contribute to tackling SGD11 goals associated with resilient communities. The results attained in slightly more than 6 months of the project's duration enabled the team to demonstrate the enormous human potential scattered all over the ECIU University ecosystem. The project's results include 4 hybrid Seminars and a fully online seminar; 1 final event held at the University of Aveiro; 1 doctoral consortium with students from 4 different ECIU University members; a total of 18 in-person visits among the DIMENDX team members (student, teaching and administrative staff); 3 Erasmus+ project applications focused on the use of Extended Reality for promoting empathy towards citizens with specific health condition or limitations, with the participation of, at least, 2 DIMENDX team members; 1 HORIZON EUROPE project application concerned with the preservation of Cultural Heritage artefacts through the use of Digital Media community engagement and involvement, with the participation of 3 DIMENDX team members. These results have further promoted the discussion of new collaboration efforts, still under discussion, that include, for instance, the joint organization of Knowledge Residence. Future work will also include the possible joint design of Microcredentials or Curricular Units dedicated to the currently hot topics, such as Artificial Intelligence Trends and Challenges; the relevance of Digital Ethics for fine-tuning today's moral compass, and Future Thinking tools and techniques for designing the future of Education, Research and Innovation. We are currently reviewing the work done, and the team is expected to produce by the end of 2023 an improved version of the framework and an introductory set of guidelines transferable and replicable in other scientific fields within the ECIU University ecosystem. Additional information may be found on the project's website at <https://dimendx.com/>.

## EFFICIENT AND SUSTAINABLE REFRIGERATION SYSTEMS INTEGRATING HEAT STORAGE MATERIALS AND RADIATIVE COOLING (ESRS-HSRC)

**RESEARCH AREA** / Energy and Sustainability

**TYPE OF ACTION** / Co-tutelle of doctoral students and industrial doctorates

**Coordinator institution** / University of Aveiro, Fernando José Neto da Silva

**Partner institutions** / Aalborg University

Domestic refrigeration equipment, widely used for food preservation, represents 17% of the global energy use. The use of renewable energy sources and the arrival of smart grids are at the lead of fighting the climate change. To fully deploy their potential, a distributed network of energy-storage facilities is required, and refrigeration systems have massive potential to perform this function. Integration into refrigeration facilities of enhanced energy-storage ability and innovative control strategies will be an energy efficiency breakthrough.

## ARRAY SIGNAL PROCESSING FOR WATER LEAK DETECTION (ASPLD)

**RESEARCH AREA** / Energy and Sustainability

**TYPE OF ACTION** / Co-tutelle of doctoral students and industrial doctorates

**Coordinator institution** / Università degli Studi di Trento, Emiliano Rustighi

**Partner institutions** / Institut National des Sciences Appliquées – Lyon

It has been estimated that, in many water distribution networks worldwide, water loss can frequently exceed 30% of the input volume due to leaks or pipe breaks resulting from holes, deterioration, and damages. The doctoral project aims at developing a device, termed *seismic camera*, which allows locating the direction of the noise sources generated from water leaks. This is a 2D array of 3-axis geophones distributed on the ground in the vicinity of a suspected leak to localise and quantify water leaks with a significantly greater accuracy and reliability than the conventional methods.

## DEVELOPMENT OF HIGH CAPACITY HYDROGEN FUEL TANK PROTOTYPE FOR VEHICULAR APPLICATIONS (DHCPHV)

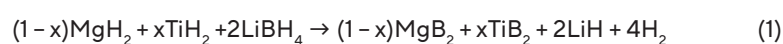
**RESEARCH AREA** / Energy and Sustainability

**TYPE OF ACTION** / BSMART-ER Seed Projects

**Coordinator institution** / University of Aveiro, D. Pukazhselvan

**Partner institutions** / University of Trento, Aalborg University

In the scope of the project *Development of High Capacity Hydrogen Fuel Tank Prototype for Vehicular Applications* in the specified duration (November 2022 to July 2023), the project team was involved mainly in the materials development for achieving the prototype. We proposed to accomplish the following RHC (reactive hydride composite) reaction (1):



Where:  $x = 0, 0.25, 0.5, 0.75,$  and  $1$ .

Our focus is to achieve a reversible capacity of over 6.5 wt.%  $\text{H}_2$  under affordable operating conditions through partial or full replacement of  $\text{MgH}_2$  with  $\text{TiH}_2$ . In this context, firstly,  $\text{MgH}_2$  needs to be synthesised, and its performance needs to be analysed. We have, therefore, firstly optimised the synthesis of  $\text{MgH}_2$  with a four-step

approach. (i) Initially, coarse Mg granular particles were ball-milled at a speed of 350 rpm for 20h under inert atmosphere (Retsch PM200); (ii) the ball-milled powder was hydrogenated at 8 bar pure hydrogen pressure at 310 °C; (iii) subsequent hydrogenation was done at 70 bar/370 °C; (iv) the powder obtained at stage (iii) was ball-milled again for 5h, and hydrogenation treatment was repeated again at 70 bar/370 °C for 5h. Through Rietveld refinement phase analysis, it was confirmed that, in steps (ii), (iii) and (iv), Mg to MgH<sub>2</sub> conversion of 4.5%, 91% and 100% could be achieved. The subsequent differential scanning calorimetry (DSC) study and kinetics study confirmed that peak endothermic dehydrogenation occurs at 370 °C and release of 5.3 wt.% hydrogen at an isothermal condition of 310 °C requires 21,600 seconds (6.5 h). Considering the necessity to improve this, an in-depth hydrogen storage test was performed by incorporating 5 wt.% of V<sub>2</sub>O<sub>5</sub> and CrO<sub>3</sub> as additives, and it was found that the activation energy of MgH<sub>2</sub> alone can be decreased from 243 kJ/mol to 175 kJ/mol.

We have also investigated how MgH<sub>2</sub> interacts with these additives. Such a mechanistic study is important as it will provide us understanding regarding the catalytic selectivity for the RHC reaction (1). In-depth characterization study employing the X-ray diffraction (XRD) technique provides convincing evidence that CrO<sub>3</sub> additive chemically interacts with MgH<sub>2</sub> and produces Cr/MgO by-products. An X-ray photoelectron spectroscopy (XPS) study is in agreement with this observation, and we have found that conversion from MgH<sub>2</sub>/CrO<sub>3</sub> to MgO/Cr happens through an intermediate phase MgCr<sub>2</sub>O<sub>4</sub>. A high resolution transmission electron microscopy study suggests that the size of in situ produced Cr is <50 nm, and that these particles are heavily embedded on the MgO matrix. Interestingly, when performing the similar set of studies for V<sub>2</sub>O<sub>5</sub> additive, we have found that V substituted MgO forms in situ, and that it actively catalyses the Mg/MgH<sub>2</sub> system. Upon comparing with our previous studies (TiO<sub>2</sub> and Nb<sub>2</sub>O<sub>5</sub> catalysed MgH<sub>2</sub>), it is of interest to note that all the 'good' additives make metal dissolved MgO as in situ catalyst and subsequently catalyses Mg-H interaction.

After accomplishing these tasks, we have proceeded with the RHC reaction shown in equation (1). (Note: Due to the non-availability of LiBH<sub>4</sub> within the stipulated time, our approach was to proceed from RHS to LHS for conducting reaction (1)). For this, LiH, MgB<sub>2</sub> and TiB<sub>2</sub> were taken in suitable proportions and initially ball-milled for 10 h under Ar atmosphere. After this, the ball-milled powder was hydrogenated under 60 bar pressure at 370 °C for 5h, and the phase structural features were analysed. We have found that it is possible to achieve the reactions  $\text{MgB}_2 + 2\text{LiH} + 4\text{H}_2 \leftrightarrow \text{MgH}_2 + 2\text{LiBH}_4$  and  $0.75\text{MgB}_2 + 0.25\text{TiB}_2 + 2\text{LiH} + 4\text{H}_2 \leftrightarrow 0.75\text{MgH}_2 + 0.25\text{TiH}_2 + 2\text{LiBH}_4$ . We have also found that x=0.5 to 1 did not provide convincing phase transformation under the conditions employed in the current study. However, further studies are underway to test these compositions by changing the preparatory conditions. Hydrogen storage tests have revealed that it is possible to achieve over 6.5 wt.% reproducible capacity by choosing x = 0 to 0.25 in reaction (1), and, as per our current understanding, if Ti is increased from 0 to 0.25 gradually, the kinetics improves, but the capacity slightly reduces. A prototype cylinder was made as per the proposal, and preliminary testing was done with MgH<sub>2</sub>. The prototype reactor/cylinder made up of stainless steel accommodates roughly a 10 g MgH<sub>2</sub> sample, but the reactor performs well with 5 g samples. Further testing/optimisation studies are ongoing.

## SUSTAINABLE AND DEPENDABLE AI (SUDAI)

**RESEARCH AREA** / Energy and Sustainability, Circular Economy

**TYPE OF ACTION** / Co-tutelle of doctoral students and industrial doctorates

**Coordinator institution** / University of Twente, Marco Ottavi

**Partner institutions** / University of Trento

AI is more and more present in our daily life. The potential of neural networks is exploited in various domains, from physics simulations to stock market prediction, social media, and autonomous vehicles. Despite the tautological benefits of AI, the training and the interference of the modern Deep Neural Networks (DNNs) is extremely computationally demanding. As a result, a significant amount of energy is required to take advantage of the current neural network models. Novel hardware/software approaches are urgently needed to drastically reduce the carbon footprint of AI frameworks. Some existing solutions reduce the power consumption by using low-power accelerators, reducing operation precision, or skipping operations.



## REVERSING INEQUALITIES AND PROMOTING SOLIDARITY IN HEALTH AT THE EUROPEAN LEVEL: TOWARDS A RESEARCH NETWORK ON THE EUROPEAN HEALTH UNION (RN4EUHEALTH)

**RESEARCH AREA** / Resilient Communities

**TYPE OF ACTION** / Blended mobility to create networks

**Coordinator institution** / Dublin City University, Volkan Yilmaz

**Partner institutions** / Tampere University, Universitat Autònoma de Barcelona, University of Aveiro

The COVID-19 pandemic, an increase of the prevalence of chronic diseases, and the climate crisis have set a challenge to address inequalities and rethink the possibilities of promoting solidarity in health at the European level. RN4EUHEALTH will enhance building a research network on the European Health Union (EHU), which is a key initiative for health emergency and disaster preparedness.

## BROWNBIN – HOUSEHOLD FOOD WASTE NEW LIFE UNDER SUSTAINABLE CITIES: A FEASIBILITY STUDY (BROWNBIN)

**RESEARCH AREA** / Circular Economy

**TYPE OF ACTION** / SMART-ER Seed Projects

**Coordinator institution** / University of Aveiro, Manuel A. Coimbra

**Partner institutions** / Kaunas University of Technology, Universitat Autònoma de Barcelona, University of Trento

The BrownBin project proposes to develop a household waste bin containing a low-cost biodegradable superabsorbent polymer able to desiccate the wasted organic matter. This allows preventing further degradation of food waste, thereby reducing the volume and weight of the waste and decreasing the periodicity that the citizens require for its emptiness. The release of off-flavours will be mitigated. For convenience, the bin will have two separated compartments, one for the organic matter, and another one for undifferentiated waste.

## ERASMUS SUSTAINABLE MOBILITY

**RESEARCH AREA** / Transport and Mobility, Energy and Sustainability

**TYPE OF ACTION** / SMART-ER Seed Projects

**Coordinator institution** / Universitat Autònoma de Barcelona, Oriol Marquet Sardà

**Partner institutions** / University of Aveiro, Aalborg University

### Abstract

In the period of 2021–2027, the Erasmus program is expected to move 10 million European students. These students, however, will inflict significantly larger carbon footprints during their stay abroad than when studying back at home. On the other hand, most international students will make intensive use of public transportation, bike sharing systems (BSS) and/or other sustainable travel options while conducting their day-to-day activities during their stays, thus offsetting some of their carbon emissions. Overall, however, very little is known about this balance between the sustainable everyday travel and the more frequent and carbon intensive leisure travel. This project will recruit a number of international Erasmus students incoming to the participating ECIU universities. We will estimate the carbon footprints of the involved students and use the study and the control groups to test a variety of information and incentive-based interventions. At the end of their stay, we will analyse whether the intervention groups had lower emissions than the control group and whether having access to information or sustainable mobility options is a significant contributor to lower carbon budgets among Erasmus students.



## INTERFACE-FRIENDLY HOLE-TRANSPORTING MATERIALS FOR LOW-COST AND STABLE PEROVSKITE SOLAR CELLS

**RESEARCH AREA** / Energy and Sustainability

**TYPE OF ACTION** / SMART-ER Seed Projects

**Coordinator institution** / Kaunas University of Technology, Dmytro Volyniuk

**Partner institutions** / Linköping University, Tampere University, Labkicosmos

A project called Interface-friendly Hole-transporting Materials for Low-cost and Stable Perovskite Solar Cells (T-i-PSCer) has been initiated. It brings together researchers from Kaunas University of Technology (KTU), Linköping University (LiU), and Tampere University (TAU). This project aims to enhance the scientific excellence and innovation capacity of three ECIU universities in developing hole-transporting materials (HTMs) for perovskite solar cells (PSCs). It leads to fruitful collaboration.

PSCs are likely to dominate the photovoltaic market in the nearest future [1]. However, there are some limitations that need to be overcome before this can happen. One such limitation is the lack of cost-effective HTMs that would enhance the stability of PSCs. Our consortium is working to develop cost-efficient HTMs and study the fundamental and applied aspects of perovskite/HTM/metal interfaces to improve device stability. The improvement in excellence, capacity, and resources of the ECIU universities is reachable by the development of efficient and cost-effective HTMs for doping-free PSCs i.e., for renewable energy applications. The T-i-PSCer project involves several activities, such as joint proposal submission (project SOL Baltic prepared for THE SI Baltic Sea Neighbourhood Programme), knowledge exchange, joint studies establishment, and publication of research papers and conference proceedings related to the project [2, 3]. The project implementers have also been involved in organizing seminars and attending conferences such as MAT-SUS-22 and ANM2022. We have established a long-term collaboration on relevant topics.

Presently, we are investigating novel HTMs with ionization potentials of 4.95–5.24 eV and hole mobility values exceeding  $10^{-3}$  cm<sup>2</sup>/Vs at high electric fields. They were involved in PSCs showing average power conversion efficiency in the 11–13% range. The environmental stability over 100 days was the main superiority of these compounds.

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## ECIU URBAN TRANSFORMATION COLLABORATORY

**RESEARCH AREA** / Resilient Communities, Transport and Mobility, Energy and Sustainability

**TYPE OF ACTION** / SMART-ER Seed Projects

**Coordinator institution** / Linköping University, Tina Schmid Neset

**Partner institutions** / University of Stavanger, Universitat Autònoma de Barcelona, University of Twente

The ECIU-Urban Transformations Collaboratory (ECIU-UTC) was funded as a one-year Seed Project in May 2022 as part of the European Consortium of Innovative Universities (ECIU). The project brings together academic and societal partners from 4 ECIU Institutes (Linköping University, Universitat Autònoma de Barcelona, Twente University, and Stavanger University), building on established collaboration with a focus on societal transformation, citizen engagement, and viable and smart cities. The project draws on a palette of local and regional challenges, jointly defined with societal partners in Norrköping/Linköping, Stavanger, Enschede, and Barcelona, aiming to achieve SDG 11 – sustainable cities and communities.

The point of departure for the project was the need to accelerate transformations towards just and sustainable future cities across Europe, which requires collaborative learning on local and regional projects to

rescale and share sustainability pathways and planning efforts. The project consortium aimed to design a roadmap towards a virtual testbed – a Distributed Living Lab, aiming to strengthen the capacities of initiatives for urban sustainability transformations through cross-case learning. The project expands the already existing research and innovation initiatives of the ECIU by linking the established living labs and testbeds run by partners and their regional ecosystems.

The project established cross-case learning opportunities engaging stakeholders and researchers to enable the development and sharing of knowledge, experiences, and skills. The core of the project were four joint Workshops, one organized by each of the partner institutes, and co-organized with the local partners, aiming to identify, select and transfer knowledge and experiences across the project sites in close collaboration between researchers and practitioners across geographical, institutional, and socio-cultural contexts. We developed a Roadmap for the ECIU-UTC Distributed Living Lab which aims to guide our future work and will be discussed at the session called *A Distributed ECIU Living Lab: Approach to Tackle Urban Sustainability Transformations* at the ECIU University Research Conference. Furthermore, the project consortium is engaged in developing the draft manuscript to be submitted to an international peer-reviewed journal on the cross-case learning and methodology.

The consortium now explores opportunities to expand the cross-case learning methodology to student exchange and course design in the future collaborative efforts by means of Erasmus+ funding.

This project can be followed on LinkedIn at:

<https://www.linkedin.com/company/eciu-urban-transformation-collaboratory/>

## RESEARCH NETWORK ON RESILIENT COMMUNITIES

**RESEARCH AREA** / Resilient Communities

**TYPE OF ACTION** / Blended mobility to create networks

**Coordinator institution** / University of Aveiro, Ana Dias Daniel

**Partner institutions** / University of Twente, Dublin City University, Kaunas University of Technology, Linköping University, Tampere University

The RESILIENT project aims at building a *Research Network on Resilient Communities* through

- the development of a collaborative net of researchers for knowledge exchange and capacity building between network partners;
- conducting new multi- and interdisciplinary research and training initiatives on critical aspects of resilient communities undertaken by the network members in collaboration;
- encouraging the dialogue between the academia and the civil society through citizen science approaches, which is needed to enhance the resilience of the local communities in practice.

This network will engage researchers from all career stages, as well as non-academic stakeholders, and the civil society, through citizen science approaches, thereby enabling the empowerment of citizens to tackle local or national problems that can foster community resilience. The results of the RESILIENT project will contribute to the UN's 2030 Agenda which call for the societal transformation towards sustainability, with a specific focus on making cities and human settlements inclusive, safe, resilient and sustainable – SDG11.

## INTERDISCIPLINARY NETWORKING FOR A SUSTAINABLE AND CIRCULAR ECONOMY

**RESEARCH AREA** / Circular Economy

**TYPE OF ACTION** / Blended mobility to create networks

**Coordinator institution** / Kaunas University of Technology, Viktorija Varaniūtė

**Partner institutions** / Linköping University, Tampere University, Universitat Autònoma de Barcelona

Peter Drucker (1909–2005) once stated that “The greatest danger in times of turbulence is not the turbulence; it is to act with yesterday’s logic.” The circular economy is a concept that has been shown to have great merits in mobilizing many different actors and professional groups to contribute to a more effective and resource-efficient, sustainable and circular society. Thus, the vision of this project is to create an interdisciplinary network for a sustainable and circular economy focusing on effective solutions and how to make them efficient from a societal perspective.

## DIGITAL TWINS FOR ENERGY OPTIMIZATION

**RESEARCH AREA** / Energy and Sustainability

**TYPE OF ACTION** / Co-tutelle of doctoral students and industrial doctorates

**Coordinator institution** / Kaunas University of Technology, Darius Pupeikis

**Partner institutions** / Linköping University

Efficient energy use is becoming increasingly significant towards addressing sustainability in the urban environment. Despite the rapidly expanding research on the energy optimization of buildings, there is still a need for data-driven solutions while managing energy supply and demand. This complex issue is influenced by many factors, such as lack of structured data, data privacy concerns, diverse federated data analytics, to name a few. At the same time, building users and managers lack understanding and tools to positively influence their performance. Departing from the Internet of Things (IoT)-based approaches, our work aims at narrowing down this gap, leveraging Machine Learning (ML) for pattern recognition and data analytics, towards more informed decision-making on the energy optimization of buildings. Our goal is to join the expertise and expand the availability of infrastructure, thus enabling case studies in both Lithuania and Sweden, where we expect to demonstrate the effective application of our tools.

## SUSTAINABLE BIOLOGICAL MANAGEMENT OF NITROGENOUS LIQUID STREAMS FROM AIR EMISSION CONTROL


**RESEARCH AREA** / Energy and Sustainability, Circular Economy

**TYPE OF ACTION** / Co-tutelle of doctoral students and industrial doctorates

**Coordinator institution** / Tampere University, Jaakko Puhakka

**Partner institutions** / University of Trento

To reduce the environmental impact of flue gases, efficient purification technologies are widely adopted, and some of them transfer the pollutants to water phase. The liquid effluents from gas cleaning may thus result in water pollution requiring new management processes. This research aims at developing a specific process for the purification of these effluents, by focusing on the removal of nitrogen originated by NO<sub>x</sub> removal via optimized biological denitrification. Other flue gas constituents or industrial waste stream supplementation to support nitrogen removal are used, thereby completing NO<sub>x</sub> removal systems without adverse impacts on water and air in a sustainable way. Potential future targets for its implementation could range from ships to pulp mills, waste incinerators, and power plants in urban environments. This application aims at improving the skills of the researcher in multidisciplinary approaches for the sustainable resolution of environmental challenges, especially in terms of developing and modelling bioprocesses, as well as building networks for the future career.



**Citizen Science  
Pilot Projects**

## CITIZEN ARENAS FOR IMPROVED ENVIRONMENTAL QUALITY & RESOURCE USE IN SMART-ER CITIES

**Coordinator institution** / Dublin City University, Fiona Regan

**Partner institutions** / Institut Nacional des Sciences Appliquées, Universitat Autònoma de Barcelona, Kaunas University of Technology, University of Aveiro, Linköping University

The objective of this proposal was to raise citizen awareness about environmental challenges and alternative management options related to water, biodiversity, waste, air, climate and energy. To do this, we proposed *Citizen Arenas* as a platform in which all these alternative options are discussed including the interests and experiences of citizens. The *Citizen Arenas* platform has connected citizens and the academia with the implementation of pilot projects across Europe where citizens have experienced first-hand benefits of shifting to new patterns of energy use, waste treatment, and have engaged in monitoring water quality and air quality as well as climate parameters, such as urban heat.

At every part of the project, citizens have played a pivotal role, by virtue of engaging in each phase of the process. This spans from orchestrating the arenas to delving into discussions, shaping research themes, forming collaborative teams comprising both citizens and researchers, crafting dedicated research projects, conducting scientific analyses, and collectively building towards their invaluable input in the ultimate discourse and dissemination phases. Citizens have also been involved in the resource management and monitoring of the Arena and the sub-pilots.

The project covered a range of the Citizen science principles mentioned by ECSA:

1. Our citizen science projects actively involved citizens in the scientific endeavour that generated new knowledge and understanding. Citizens of all ages acted as contributors, and collaborators in each of the chosen areas: Water, Biodiversity, Urban Heat, and Air Quality.
2. Our citizen science projects have gathered genuine raw data which still needs to be analysed and may be used in further research.
3. Not only professional scientists but also citizen scientists have benefited from taking part. Benefits vary from project to project, and all have been extremely educational. The project has brought many benefits to communities from some surveys conducted after citizen engagement events.
4. Many of the projects developed a co-creation approach where citizens were involved in designing scientific questions.
5. Citizen scientists received feedback from the project in terms of reports and updates on progress throughout the projects (some are still ongoing).
6. Citizen scientists will be and have been acknowledged in the final project results and publications.

The culmination of our citizen science journey will transpire in a reflective and collaborative learning environment at the Final Arenas. Here, the profound insights from various pilot initiatives will be analysed and harmoniously integrated.

## EMPOWERING URBAN CYCLISTS THROUGH CITIZEN SCIENCE

**Coordinator institution** / Universitat Autònoma de Barcelona, Jordi Honey-Roses

**Partner institutions** / Dublin City University, Tampere University, University of Twente, University of Aveiro

BiciZen is an open and collaborative platform which crowdsources data about everyday cycling experiences, thus providing invaluable insights to improve the cycling infrastructure and promote a sustainable, eco-friendly lifestyle. As an innovative solution, BiciZen empowers cyclists by enabling them to share information about bicycle parking, theft, safety, conflicts with other road users, and obstructions in cycle paths. Additionally, the app allows users to suggest improvements to cycling infrastructures and report positive cycling experiences, thereby fostering a strong cycling community.

BiciZen was developed through research collaboration between five universities of the European Consortium of Innovative Universities (ECIU), funded by the ECIU SMART-ER seed program for citizen science.

By participating in BiciZen, users contribute to a larger dialogue on the future of bicycle infrastructure in their cities. It also is a platform for city officials to understand patterns and problems related to urban cycling. The data collected on the BiciZen platform offers a historical record of cycling incidents, events, and commentaries, which can be consulted by all stakeholders, including activists, city planners, and researchers.

The BiciZen app is now available for download on both iOS and Android platforms. As a testament to its commitment to openness and collaboration, the anonymised datasets collected through the app will be shared as open data for research use.

Since the launch of BiciZen in June 2023, the platform has received over 3,000 contributions from hundreds of users in over 15 countries. The platform is on track to receive over 14,000 contributions in its first year, which would surpass our most optimistic expectations. Furthermore, the BiciZen team has been contacted by municipal governments and bicycle advocacy organizations to develop partnerships and campaigns. We are currently aiming to raise funding to expand the project, translate the platform to French, and maintain support for our Communications and research team.

More details about the launch of BiciZen can be found [here](#).

## ESTABLISHING A COMMUNITY ON EMPOWERING, INCLUSIVE, AND EQUITABLE CITIZEN SCIENCE WITHIN ECIU (ECIU-ECIE)

**Coordinator institution** / University of Twente, Maya van den Berg

**Partner institutions** / Dublin City University, Kaunas University of Technology, University of Aveiro, Linköping University, Tampere University

ECIE aims to contribute to making citizen science research more inclusive.

We want to promote the empowerment and inclusion of citizens, especially those from minority groups (e.g., migrants, elderly) so that they can have equitable participation in CS initiatives. ECIE aims to advance the development of citizen science initiatives in and among ECIU universities by focusing on empowerment, inclusion, and equity in research design and implementation. To do this, we aim to establish a Community of Practice on citizen social science within the ECIU network. The main research question we address is: “How can we ensure the empowering, inclusive and equitable participation of citizens in citizen science within the ECIU network?” as we argue that there is a gap in the literature to which we contribute to the ways how to make CS more inclusive.

The ECIE project undertakes to:

- generate a review of the current CS initiatives
- deliver a Framework for Empowering, Inclusive, and Equitable CS to be applied within the ECIU network and
- develop a strategy for the Community on Empowering, Inclusive, and Equitable Citizen Science to be applied within the ECIU.

At the ECIE Research conference, the community will be formally launched.



The SMART-ER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101016888. This result only reflects the author's view and the EU is not responsible for any use that may be made of the information it contains.



**Co-funded by  
the European Union**