THE SECOND EURECA-PRO CONFERENCE

ON RESPONSIBLE CONSUMPTION AND PRODUCTION

A place to share the experience, scientific results, and the most recent advances to achieve Sustainable Development Goal 12

19th – 21st October 2022

León (Spain)

SCIENTIFIC PROGRAMME

Co-funded by the Erasmus+ Programme of the European Union

Preface and Welcome

The **Second EURECA-PRO Conference on Responsible Consumption and Production** provides an interdisciplinary forum for practitioners, academics, and scientific experts on the most recent advances to achieve UN Sustainable Development Goal 12 (SDG12), embracing the challenges posed by the European Green Deal. As such, the Conference aims to represent a unique place to share experiences, scientific results, and visions for making the EU's economy sustainable by covering all sectors, especially transport, energy, agriculture, buildings, and industries. The Conference also aims to constitute a benchmark for leading researchers in the SDG12 field to discuss current and future challenges, opportunities, and innovative solutions considering the technological, humanistic, economic, social, and environmental dimensions of responsible consumption and production.

The **EURECA-PRO ('European University on Responsible Consumption and Production')** Alliance consists of nine higher education institutions: Montanuniversität Leoben (Austria), Technische Universität Bergakademie Freiberg (Germany), Technical University of Crete (Greece), Universidad de León (Spain), Silesian University of Technology (Poland), University of Petrosani (Romania), University of Applied Sciences Mittweida (Germany), Hasselt University (Belgium), and University of Lorraine (France). EURECA-PRO integrates their joined forces to become the global educational core hub and interdisciplinary research and innovation leader in environmental and social framework development under the umbrella of SDG12, effectively contributing to the European Higher Education Transformation Agenda. Through the implementation of five Research Lighthouse Missions (LH) (LH1: 'Responsible Material Flows', LH2: 'Environment and Water', LH3: 'Sustainable Materials and Products', LH4: 'Clean Energy', and LH5: 'Process Automation and Industry 4.0'), EURECA-PRO is creating a research environment focused on actively developing solutions to SDG12 current global challenges.

In this **Scientific Programme** readers will find the full schedule of the Conference taking place in León (Spain) between the 19th and the 21st of October 2022. The Programme is composed of excellence-based plenary talks, expert panel discussions, oral communications, and poster presentations dealing with the following five topics:

- *Smart and Healthy Societies* (LH2 and LH5)
- *Recycling, Reuse, and Longer Lasting Products* (LH1 and LH3)
- *Clean Air, Freshwater, Healthy Soil, and Biodiversity* (LH2)
- *Cleaner Energy and Cutting-Edge Clean Technological Innovation* (LH4)
- *Industry 4.0*. (LH5)

We truly hope that the Conference will be fruitful for all, that it will allow us to discover a reality that may be new for some, and that it will stimulate the fluid exchange of information and ideas. This has been, and will be, the desire and purpose of all of us. Thanks to the participants and to the organizing team for giving us this opportunity. The rest of us have no choice but to make the most of it. **On behalf of the Organising Committee, we warmly welcome you to the Second EURECA-PRO Conference in León!**

Organizing Committee

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Scientific Committee

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- Raquel Liébana García – Marine Ecosystems Foundation (AZTI)
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- Pedro Gullón Tosio – University of Alcalá
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- Philip Shapira – University of Manchester
- Paula García Llamas – University of León
- Maria João Feio – University of Coimbra & Marine and Environmental Sciences Centre

Scientific Programme

Thursday, 20th October 2022

9:00-9:45h – **Closed Rectors session** (*Faculty of Biology, Aula Magna*)

9:45-10:15h – **Open ceremony** (*Faculty of Biology, Aula Magna*)

10:20-11:15h – **Plenary session** (*Faculty of Biology, Aula Magna*)
Anti-Ephemeral Design for Responsible Production and Consumption of Mobility – ***Artur Grisanti Mausbach***

11:15-11:45h – **Coffee break**

12:00-13.30h – **Panel discussions**

1: Environment and energy (LH2 and LH4) (*Faculty of Education, Salón de Grados*)
Chairperson: Evaggelos Diamantopoulos
Participants: ***Mónica Álvarez Manso*** *(Global Virtualizza Ingenieros SL),* ***Jimeno Fonseca*** *(AXPO GRID),* ***Carsten Drebenstedt*** *(Technical University Freiberg)*

2: Circular economy (LH1 and LH3) (*Faculty of Education, Aula Magna*)
Chairperson: Susanne Feiel
Participants: ***Noemí Barrientos Herrero*** *(León Startup),* ***Beatriz Jiménez Parra*** *(University of León),* ***Sabin Ioan Irimie*** *(University of Petrosani),* ***Artur Grisanti Mausbach*** *(Royal College of Art Research Centre)*

3: Smart and healthy societies (LH5) (*Faculty of Biology, Aula Magna*)
Chairperson: José Alberto Benítez Andrades
Participants: ***Manuel Franco*** *(University of Alcalá),* ***Jairo Luzón*** *(HPE CDS),* ***Barbara Wedler*** *(University of Applied Sciences of Mittweida)*

13:30-15:00h – **Lunch break** (*Frontón universitario*)

15:00-16.30h – **Oral sessions**

- **Smart and healthy societies** (LH2 and LH5) (*Faculty of Education, Salón de grados*)
  Chairperson: Mª del Pilar Marqués Sánchez

15:00-15:15h- About *responsibility* in production and consumption – ***Sarah Kollnig***
15:15-15:30h- Sustainable Food, key for the Future of the Planet: Getting to know the European consumer of sustainable products – *María Aránzazu Sulé Alonso,* ***Victoria Mirallas Abella, Inés Barbeta Martínez***
15:30-15:45h- Designing sustainable and healthy cities: 'obligations' under International and European law - ***Caroline Van Esbroeck***

15:45-16:00h- Text classification of users claiming to have ASD using traditional machine learning techniques - ***Sergio Rubio-Martín***, *María Teresa García-Ordás, Martín Bayón-Gutiérrez, Silvia Martínez Villamea, Natalia Arias-Ramos, José Alberto Benítez-Andrades*
16:00-16:15h- The Cost of Going Green in the Jiu Valley - ***Anne-Marie Bartalis***
16:15-16:30h- The role of public policies and tourism to face the demographic challenge and sustainable production - ***Adriana Carolina Ávila Hernández***

- **Recycling, reuse, and longer lasting products** (LH1 and LH3) (*Faculty of Education, Aula Magna*)
  Chairperson: María Fernández Raga

15:00-15:15h- Life Cycle Assessment for the Primary Raw Materials Extraction Industry – ***Jan C. Bongaerts***, *Carsten Drebenstedt*
15:15-15:30h- Physical Processing in Waste Printed Circuit Boards Recycling: current state of research - ***Dawid M. Franke***, *Tomasz Suponik, Paweł M. Nuckowski*
15:30-15:45h- Damage Tolerance Approach in the Concept of Quality Control Workflow of Passive CFRP Strengthening of Reinforced Concrete Structures – *Rafał Białozor,* ***Marcin Górski***
15:45-16:00h- Circularity and sustainability of bio-based polymer/natural fiber reinforced composite - ***Bharath Ravindran***, *Ralf Schledjewski*
16:00-16:15h- Circular economy polices in the concrete production - *P. Jagadesh, T. Karthik Prabhu, Jesús de Prado-Gil,* ***Víctor Baladrón-Blanco***, *Daniel Merino-Maldonado, Andrea Antolín-Rodríguez, Andrés Juan-Valdés, Rebeca Martínez-García*
16:15-16:30h- Resin degradation of end-of-life wind turbine blades to produce useful chemical compounds in the context of waste to resource recovery - ***Hamza Mumtaz***, *S. Werle, S. Sobek, M. Sajdak, R. Muzyka*

16:30-16:45h – **Coffee break**

16:45-18:15h – **Oral sessions (continuation)**

- **Smart and healthy societies** (LH2 and LH5) (*Faculty of Education, Salón de grados*)
  Chairperson: Mª del Pilar Marqués Sánchez

16:45-17:00h- Virtual Exchange as a Sustainable Approach to Intercultural Learning - ***Ángela María Alonso Morais***
17:00-17:15h- The zero pollution ambition. European main cities urban sound environment analysis - ***Laura Estévez-Mauriz***, *Jesús Cepeda Riaño, Mercedes de Barrios Carro, Miguel Ángel de Barrios Carro*
17:15-17:30h- How implementing SDG 12 in teaching helps students develop prosocial skills? - ***Abir Zitouni***, *Roberto Baelo*

- **Recycling, reuse, and longer lasting products** (LH1 and LH3) (*Faculty of Education, Aula Magna*)
  Chairperson: María Fernández Raga

16:45-17:00h- Life cycle assessment for sustainable methods and techniques in the Cement production - *Jesús de-Prado-Gil, Karthik Prabhu T, P. Jagadesh, Fernando J. Fraile-Fernández, Pablo Gutiérrez-Rodríguez, Covadonga Palencia,* ***Rebeca Martínez-García***

17:00-17:15h- Research on hard drives in the context of the construction of shredding knives in the recovery of rare earth elements - ***Paweł Friebe****, Tomasz Suponik, Paweł Nuckowski*

17:15-17:30h- An insulation panel made from local plant-based lightweight concrete - ***Claire Oiry****, Kali Kapetanaki, Pagona-Noni Maravelaki*

17:30-17:45h- Production of nanobiochar from sewage sludge for the adsorption of Emerging Contaminants (ECs) from water and wastewater - ***Panagiotis Regkouzas****, E. Diamadopoulos*

17:45-18:00h- Responsible heritage protection actions - ***María Fernández-Raga****, José Miguel González, Pablo Caldevilla, Gabriel Búrdalo, Almudena Ortíz, Rebeca Martínez, Fernando Jorge Fraile-Fernández, Indira Rodríguez*

21:00h – **Conference dinner** (*Hotel Real Colegiata San Isidoro*)

23:30h – **Post party** (*Lobo42norte, Plaza Mayor*)

Friday, 21st October 2022

9:30-10:45h – **Oral sessions**

- **Clean air, freshwater, healthy soil, and biodiversity** (LH2) (*Faculty of Education, Aula Magna*)
  Chairperson: Mª Flor Álvarez Taboada

9:30-9:45h- Religious slaughtering, could be labelled 'green'? - ***Paulino César Pardo Prieto***
9:45-10:00h- Can the fate of the non-avian dinosaurs help us to predict the consequences of the ongoing biodiversity crisis? - *Olga Muñoz-Martín,* ***Jorge García-Girón***
10:00-10:15h- Teachers' perceptions of fisheries ecolabels and game-based learning activities in the framework of Education for Sustainable Consumption – *Ana Celestina Paredes-Rodríguez,* ***Antonio Torralba-Burrial****, Eduardo Dopico*
10:15-10:30h- Ecological risks of post-artisanal mining sites and their sustainable cleaning techniques - ***Martin Kofi Mensah****, Carsten Drebenstedt, Ibukun Momoriola Ola, Precious Uchenna Okoroafor, Edward Debrah Wiafe*
10:30-10:45h- Study on the soil formation process on the mining waste dumps from Jiu Valley (Romania). A case study – *Maria Lazar, Emilia-Cornelia Dunca, Florin Faur, Izabela-Maria Apostu,* ***Sabin Irimie***

- **Cleaner energy and cutting-edge clean technological innovation** and **Industry 4.0** (LH4 and LH5) (*Faculty of Education, Salón de Grados*)
  Chairpersons: Javier Díez González, Rubén Ferrero Guillén

9:30-9:45h- Impact of the Operation Conditions on the Reverse-Water-Gas Shift Reaction - ***Christoph Markowitsch****, Markus Lehner*
9:45-10:00h- Improving sustainability in Industrial Plant Construction Available tools and methods - ***Eusebio Baranda Rodríguez***
10:00-10:15h- Comparative Exergy Analysis of Heat Pumps for Heat Recovery Applications - ***Ion Dosa***
10:15-10:30h- Consumption behaviour in the context of sustainable energy: theoretical approach - ***Aušra Pažėraitė, Svetlana Kunskaja***
10:30-10:45h- Energy Saving Technology Integration into the Transport Sector; the Influence of Years of Driving and Gender on Electric Vehicles - ***Angelina Atuobi Ampadu,*** *Akvile Cibinskiene*

10:45-11:30h – **Coffee break** and **Poster sessions** (Faculty of Education, Hall)

11:30-13:00h – **Oral sessions (continuation)**

- **Clean air, freshwater, healthy soil, and biodiversity** (LH2) (*Faculty of Education, Aula Magna*)
  Chairperson: Mª Flor Álvarez Taboada

11:30-11:45h- Multitemporal optical remote sensing to support forest health condition assessment of Mediterranean pine forests in Italy - ***Giovanni D'Amico***, *Saverio Francini, Francesco Parisi, Elia Vangi, Elena De Santis, Davide Travaglini, Gherardo Chirici*

11:45-12:00- Web application based on Sentinel-2 satellite imagery for water stress detection and monitoring in poplar plantations - *Y. Arhrib, S.J. Francini, G. D'Amico, F. Castedo-Dorado,* ***J. Garnica-López, M.F. Álvarez-Taboada***

12:00-12:15h- Mapping and estimation of carbon dioxide storage in forest plantations. The contribution of the Sentinel-2 time series in increasing estimates precision - ***Saverio Francini***, *Elia Vangi, Giovanni D'Amico, Guido Cencini, Cecilia Monari, Gherardo Chirici*

12:15-12:30h- AppPopuli: Web application for real-time damage report in poplar plantations using citizen science - *S. Díez Reguera, J. A. Benítez-Andrades, F. Castedo-Dorado, A. Rodríguez González,* ***R. Arévalo González, E. Díez-Presa****, J. Garnica-López, M. F. Álvarez-Taboada*

12:30-12:45h- Near-real time forest health monitoring using ecophysiological sensors and the Internet of things (IoT). A study case for water stress in sustainable poplar plantations - *I. Grisales-Sanchez, R. Arthus-Bacovich, F. Castedo-Dorado,* ***J. Garnica-López, F. Álvarez-Taboada***

- **Cleaner energy and cutting-edge clean technological innovation** and **Industry 4.0** (LH4 and LH5) (*Faculty of Education, Salón de Grados*)
  Chairpersons: Javier Díez González, Rubén Ferrero Guillén

11:30-11:45h- Scale model showcase to drive policy making via IoT composite indices and low-resource equipment at the edge of the computing continuum - ***Rafael Vaño***, *Ignacio Lacalle, Carlos E. Palau*

11:45-12:00- Introduction of Integrated Resource Management for Sustainable Development of Industries - ***Stefan Kernbauer***, *Alexandra Groiss*

12:00-12:15h- Validation of a double wall reactor for direct biogas upgrading via catalytic methanation - ***Katrin Salbrechter***, *Andreas Krammer, Markus Lehner*

12:15-12:30h- Autonomous Smart Electric Vehicle integrated into a Smart Grid type System - ***Cosmin Rus***, *Monica Leba*

12:30-12:45h- Wireless industrial access control systems for autonomous transportation - ***Alberto Martínez-Gutiérrez***, *Javier Díez-González, Rubén Ferrero-Guillén, Paula Verde, José-Manuel Alija-Pérez and Hilde Pérez*

12:45-13:00h- Industrial applications of the Internet of Things - ***Gerta Kapllani***

13:00-14:00h – **Plenary session** and **Closing ceremony** (*Faculty of Biology, Aula Magna*)
Implementing constructed wetlands for sustainable water management in a circular economy: examples and case studies – ***Alexandros Stefanakis***

14:00h – **Lunch break** (*Frontón universitario*)

17:30h – **Free León City Tour** (*'LEON' letter sign in front of the Cathedral*)

Plenary sessions

Anti-Ephemeral Design for Responsible Production and Consumption of Mobility

Artur Grisanti Mausbach

Automotive Transitions Studio at the Royal College of Art Intelligent Mobility Design Centre (RCA IMDC)

According to Yuval Noah Harari (2018), the twentieth century presented a battle between fascism, communism, and liberalism, ultimately won by the latter, but as "history took an unexpected turn", a crisis also hit the liberalism. While the economic crises of 2008, is cited as one of the reasons for the degeneration of liberalism, the climate crises and the sanitary crises highlighted that the aims and achievements of society were vain, and its values need to be reviewed. According to Umberto Eco (2016) a crisis has extended to the concept of community, giving rise to "unbridled individualism", and "led to the collapse of ideologies"; then, without sharing values or being part of something, individuals are pushed to follow consumerism. One which Stuart Walker (2017) signals as the kind of consumerism that turns everything obsolete, creating more frustration than satisfaction, and cultivating a society of selfishness, envy, and greed.

The design developed as part of the twentieth century economic systems is a reflection of their values and production systems. In the automotive industry, the pursuit for higher qualities of the products has been aligned to the mindset of societies which were less attentive to the consequences of their actions to others and the environment, according to Jackson (2009), a "age of irresponsibility". Car design has served a system of consumption which depends on constant growth, massive amounts of resources for production and use, and responding to fashion cycles which ironically has rendered the contemporary car mostly irrelevant in meaning and emotional value. The ephemerality of car design raises questions about the designers' responsibility, which has been discussed by Papanek, Bonsiepe, Manzini and others, but has not yet reached car design to support a cultural shift.

Cars have never been merely a tool. From its inception, it was both a utilitarian and a symbolic object, which quickly evolved its own imaginary context, represented by the myths of Speed, Freedom and Comfort (Mausbach, 2010). The 20th century Car design focused on attracting the consumer, expressing personality, and innovation. In the beginning of the 21st century the car is facing a moment of radical change. Electrification of powertrain, shared use,

and autonomy are challenging the paradigms of the automotive industry and stimulating the replacement of the current fleet by new vehicles. How to deal with the current world fleet of 1.4 billion cars has not been addressed by automotive design, which is focusing on creating the novelty. Proposals of circular economy must start from existent objects, and its already embodied carbon footprint. Moreover, the transition also interferes with the way people consume and experience cars. While this might create a demand for new cars, it does not consider if people are prepared to replace their vehicles, financially or emotionally. Ephemerality of products need to be discussed in relation to the possible design strategies. Both the embodied carbon and their meaning, cultural and personal sensitivities are significant parts of a product.

Indeed, deeper transformations are needed to deal with the environmental, societal and climate crisis that humanity is facing now. Particularly, to improve the model of interaction between the industry and the natural environment in the direction of sustainability, our social, ethical, aesthetic, and economic paradigms need to shift, and both our subjective and objective experiences need to be addressed. Stuart Walker (2017) proposes to extend the foundation of sustainability to a Quadruple Bottom Line, pointing out that creative design endeavours should be informed by their Practical Meaning, Social Meaning, Personal Meaning and Economic Means. Therefore, when looking at the transition of the automobile and its consumption, we should also investigate the subjective aspects of design.

The Ecofitting project was developed at the Royal College of Art Intelligent Mobility Design Centre with the support of CENTS (Circular Economy Network + In Transportation Systems) from February 2020 to January 2021. Ecofitting is a sustainable solution for the large UK fleet of internal combustion engine cars that is rendered non-compliant with initiatives like the Ultra-Low Emission Zones. Focused on sustainability and conceived as circular economy strategy, Ecofitting goes beyond just electrification, opening an opportunity for new approaches to automotive design, and to cater for generational shifts in desirability. The project findings indicate that there are promising opportunities for developing automotive design differently, it also points out that Ecofitting is an effective sustainable solution which respects emotional and cultural values of cars, promotes long-term ownership, and can change how cars will be designed in the future.

The transition to sustainable mobility is urgently needed to fight climate change, and at the same time it can produce great environmental impact. According to Ekins (Whitelegg,1993) the Impact on the environment is a product of People, times Consumption, times Technology (I= PCT). It is necessary to re-think production and consumption, and design becomes a strategic tool. It is necessary that design moves from being part of the problem to being part of the solution. Otherwise, the new paradigms of sustainable mobility, Autonomous, Electric, and Shared, will become the new myths.

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Plenary sessions

Implementing constructed wetlands for sustainable water management in a circular economy: examples and case studies

Alexandros Stefanakis

School of Chemical and Environmental Engineering, Technical University of Crete in Greece

We realize today that the unsustainable way that our societies grow, consume, and waste natural resources. While resources such as water, fossil fuel, and nutrients are becoming scarce, climate change is progressing. Sustainable development implies the need to identify tools to properly manage our water resources. However, the challenge is to understand the interconnections and synergies between technical and non-technical/social/management and economic aspects. Circular economy appears today as an alternative economic model that can guarantee the economic growth while minimizing – or ideally eliminating – the climate change impacts. It dictates that new solutions are required to deal with waste; in fact, in a circular economy, waste is no longer viewed as 'waste' rather than as a valuable input/material to another process. This new approach also demands new solutions and processes that will not generate an environmental impact themselves while targeting at solving an environmental issue and/or minimizing a different environmental impact (Stefanakis and Nikolaou, 2021).

Although the circular economy model is already studied and proposed by many governments and international organizations, water resources management and especially wastewater management has not received the similar attention in the context of circularity as is the case of, e.g., solid waste. The relevant discussion has only begun in recent years with proposals aimed at reducing consumption, reusing and recycling of water and wastewater and recovery of materials and nutrients. In general, we can say that liquid waste (human waste, rainwater, runoff) remains the largest untapped waste category, but it is a pillar of circular economy as defined by the European Commission.

Water reuse has been practiced world-wide under varying regional/local conditions for decades and is recognized as a vital part of integrated water resources management in many countries. Meanwhile, recent developments in the concepts of climate change adaptation, sustainability and circular economy, as highlighted in the EU Green Deal, and the UN Sustainable Development Goals for clean water and sanitation, are providing a renewed interest

and awareness on water reuse, and in some cases increased funding opportunities. On the other hand, these recent initiatives may neglect continuing attention to traditionally recognized challenges, such as public acceptance, economic feasibility, and planning and implementation for the protection of public health under specific local conditions.

At the moment, wastewater recycling initiatives have emerged mainly in countries facing the problem of reduced water availability mostly due to the effects of climate change and the increasing cost for drinking water production. The European Union published just in 2020 a new regulation on water reuse with limited application in agriculture. There is therefore a lack of a comprehensive plan for the sustainable and efficient use of wastewater.

In this context, Nature-based solutions (NBS) are more and more widely recognized as important tools in climate action, in addressing societal challenges, protecting, and restoring ecosystems and supporting biodiversity conservation (Stefanakis et al., 2021). NBS represent an attractive and useful toolbox for sustainable strategies that can play a key role in the implementation of the European Green Deal. The European Commission sees NBS as part of the EU Climate Pact and even promotes nature-based learning initiatives. This is why the use of NBS such as the green technology of Constructed Wetlands (CW) is gaining increasing global attention and popularity over the last years. This technology in particular, has typically few mechanical parts, limited maintenance and operation needs, limited or even no need for specialized staff, minimized use of non-renewable materials (concrete, steel etc.), design flexibility and replicability, minimum greenhouse gas emissions, minimum or even zero energy consumption, and produces no harmful by-products.

NBS can provide solutions that contribute towards a more circular management of water and wastewater. NBS change the processes used to treat wastewater to reduce the pollutants load by applying ecological engineering techniques with reduced carbon footprint and minimized use of materials. Moreover, and most important, NBS can provide the option to further valorize the treated effluents for beneficial reuse, e.g., for irrigation of crops or recycling in an industrial process, closing this way the loop of water as a natural resource in the economic model and promoting circularity aspects and practices (Figure 1).

Figure 1. *Left: a constructed wetland system in the Czech Republic for wastewater treatment and reuse. Right: a constructed wetland system in Oman for oily water treatment reuse*

This plenary talk will document this approach through a series of case studies that demonstrate the feasibility, scalability and opportunities provided by CW technology for

circular wastewater management and reuse of different wastewater sources. These examples will help reflecting how water reuse projects may fit into the context of sustainability and circular economy and be promoted not only in the rural context but also in the urban environmental and the industrial sector. The case examples highlighted in the plenary talk will be from Europe, South America, Asia, Middle East and Africa (Stefanakis, 2018; 2020).

Identifying sustainable management ways for wastewater effluents is a key factor towards expanding and implementing the circular economy principles. New, green technologies are needed to enhance the sustainable character of wastewater management, especially in the industrial sectors, but also new initiatives to close the materials cycle and promote water reuse and recycling. Nature-based solutions such as the green technology of Constructed Wetlands can provide these desired characteristics. The case studies presented here from different wastewater sources and different climatic conditions demonstrate that the dual goals set of implementing sustainable technologies and circular practices is technically and economically feasible at various scales. The use of Constructed Wetlands for wastewater allows the recycling of the treated effluent in the industrial process reducing this way the freshwater consumption. It also enables the reuse and exploitation in irrigation to produce valuable crops. These examples of wastewater management indicate the potential to close the loop of water and promote circularity aspects and practices in the water sector.

References

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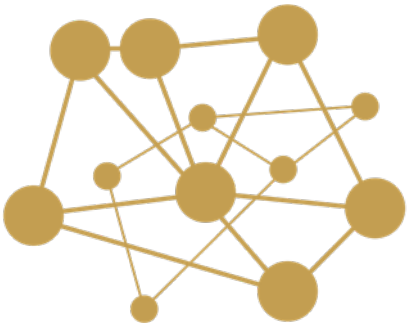
ORAL PRESENTATION SESSIONS



Oral sessions - *Thursday 20th October 2022, 15:00-16:30h*

Smart and healthy societies

(*Faculty of Education, Salón de Grados*) *15:00-15:15h*

About *responsibility* in production and consumption

Sarah Kollnig

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This paper aims at bringing out the complexities of Sustainable Development Goal 12, Responsible Consumption and Production. This is done in the context of the EURECA-PRO initiative, the European University on Responsible Consumption and Production. The author argues that the official description of SDG 12 takes responsibility and sustainability to have the same meaning, as well as producers and consumers to be enlightened and behaving voluntarily in a responsible manner. In a more differentiated approach, responsibility means taking concrete actions towards strategic sustainability goals. Producers take on this responsibility only in a voluntary manner, when it pays off for them not to keep externalizing the socio-ecological costs of their actions. Consumers do not automatically act responsibly either, since many of them do not have the capabilities or economic possibilities to take part in responsible consumption. Concluding, the author argues that collective agency can be a way towards holding corporations accountable for their actions, as well as towards creating possibilities for consumers to participate in responsible consumption practices.

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Smart and healthy societies

(*Faculty of Education, Salón de Grados*) *15:15-15:30h*

Sustainable Food, key for the Future of the Planet: Getting to know the European consumer of sustainable products

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In recent decades, the unsustainability of mass production and consumption models has become evident. The sustainable food market is born in response to the growing demand for products that are respectful with the Planet and compromised with the health of human beings. Responsible Consumers lead this new market, by being conscious of the impact of their consumption patterns and by choosing the products, to make up their diet and lifestyle, that contribute to build a more Sustainable and Fair Food System. The present study focuses on analyzing and defining Sustainable Consumer profile's: its behavior, its habits, its preferences; as well as those variables and factors that inhibit or motivate the consumption of Sustainable Food. Reaching a better understanding of one the main agents of the transition of the agri-food system towards a more sustainable one is key for both, private and public organizations, as this new market is booming and will continue growing in the coming years.

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Smart and healthy societies

(*Faculty of Education, Salón de Grados*) *15:30-15:45h*

Designing sustainable and healthy cities: 'obligations' under International and European law

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Due to climate change, cities are increasingly affected by heavy rains, floods, and heat waves. Moreover, these phenomena are more noticeable in cities because of urban characteristics. For example, expanding grey infrastructure can strengthen the urban heat island effect, increase risk of flooding and negatively affect mental health. Adapting cities to the effects of climate change is therefore crucial. Nature-Based Solutions (NBS) are increasingly being put forward as a possible solution. However, their use is still very limited. Law can play an important role in this adaptation process towards sustainable and healthy cities. This research states that there is no binding individual right to a healthy environment neither at the international, nor at the European level. However, the resolution of the UN on a human right to a clean, healthy and sustainable environment, which can be qualified as soft law, can have a several impacts. Besides that, obligations to take measures to prevent the harmful effects of global warming, do arise from the European Court of Human Rights' (ECtHR) case-law (articles 2 and 8 ECHR). The ECtHR leaves a broad margin of appreciation to States in choosing mitigation and adaptation measures. This margin offers the States the opportunity to think outside of the box and to look for example towards Nature-based Solutions instead of the grey alternatives. It can be argued that, in the future, those obligations may also be derived from human rights, contained in the Charter of Fundamental Rights of the European Union.

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Smart and healthy societies

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Text classification of users claiming to have ASD using traditional machine learning techniques

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Autism spectrum disorders (ASD) are developmental disabilities caused by differences in the brain. According to the WHO, ASD affects 1% of the population. However, many people are still undiagnosed. Thanks to artificial intelligence, more and more research is being carried out with the aim of obtaining early diagnoses that help to reduce the negative impact of the diseases or even prevent them. For all these reasons, this research has been carried out by collecting and tagging data through the social network Twitter. These tweets were obtained from users who, in their biography, indicated that they suffered from ASD or were relatives of someone with ASD. Subsequently, the set of tweets obtained was preprocessed, generating a set of 404,627 tweets, thanks to which text classification techniques, Random Forest and Support Vector Classifications, were applied. The results show predictive models with an accuracy of over 74% when classifying texts that may come from people with ASD. The research, despite its limitations, opens up a new line of research that may improve the diagnosis of this disease. Autism spectrum disorders (ASD) are developmental disabilities caused by differences in the

brain. According to the WHO, ASD affects 1% of the population. However, many people are still undiagnosed. Thanks to artificial intelligence, more and more research is being carried out with the aim of obtaining early diagnoses that help to reduce the negative impact of the diseases or even prevent them. For all these reasons, this research has been carried out by collecting and tagging data through the social network Twitter. These tweets were obtained from users who, in their biography, indicated that they suffered from ASD or were relatives of someone with ASD. Subsequently, the set of tweets obtained was preprocessed, generating a set of 404,627 tweets, thanks to which text classification techniques, Random Forest and Support Vector Classifications, were applied. The results show predictive models with an accuracy of over 74% when classifying texts that may come from people with ASD. The research, despite its limitations, opens up a new line of research that may improve the diagnosis of this disease.

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The Cost of Going Green in the Jiu Valley

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The current study aims to argue, as objectively as possible, the importance of a transition to green energy, and also tries to cover several perspectives, but with an emphasis on the social and financial economic perspectives. It is an attempt to raise awareness of the importance of the growing eco-friendly economy, and also to educate as much as possible the civil society and the political class as well as the businesspeople and the citizens, trying to convince them that this transition to green and renewable energy is profitable from all points of view. Transitioning to green energy is more difficult in the mining areas due to the nonindustrial aspect and must take into consideration all the socio-economical aspects that arise from the closing of the mines. Also, we have to be aware of the fact that the transition to green energy is a long process that will reshape communities and futures.

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The role of public policies and sustainable tourism to face the demographic challenge and sustainable production

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In the current context, the situation of the Spanish rural environment, its depopulation, as well as the alternatives that must be addressed from the public administration to address this problem, possesses within the agenda of the State to find a way to revitalize the countryside, in particular to light of the most recent world events that have occurred since 2020, which have evidenced that the food strength of the country goes hand in hand with the generation of strategies that to serve the increasingly depopulated rural environment. We intend to make a brief illustration of this phenomenon, making a global analysis of the situation to then focus on the province of León, analyzing the causes of the depopulation of its rural environment, the negative vegetative growth that has been experienced in recent decades and that still impacts the region today, the consequences that this situation has brought to the countryside, as well as the strategies, public actions and policies developed at the administrative level to address this a problem that is spreading more and more throughout the various Spanish Autonomous Communities. With this panorama in mind, we will review the trends related to sustainable tourism, the viability of implement a sustainable tourism strategy aimed at demographic revitalization for the Province of León, the responsible use of its resources natural resources, as well as the guarantee of their survival, within a component of public policy for the sustainable growth of environments.

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Virtual Exchange as a Sustainable Approach to Intercultural Learning

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The purpose of this paper is to provide insight into Virtual Exchange, a relatively underdeveloped tool for the internationalization of Higher Education Institutions (HEIs) that offers a sustainable, easily-accessible opportunity to enhance students' intercultural communicative competence (ICC). Several studies have reported a lack of authentic intercultural learning and skills in university students who come back to their home institution after a study abroad experience. With this in mind, it has been argued that students need a preparatory phase to reflect and acquire skills to cope with the difficulties of studying abroad and the knowledge to fully benefit from the stay. In addition, students whose financial or personal situation does not allow them to go on exchange should also have the chance to become intercultural aware and skilled. This paper examines the sustainable component of virtual exchange (VE) and presents a newly designed model of exchange for undergraduate students of the EURECA-PRO alliance. This project is underway at the University of León and is one of a few recent examples of online pre-mobility that can be found in Europe. It is a multicultural free programme, firmly committed to a sustainable accessible-to-all education that fosters the development of intercultural sensitivity, transversal or soft skills, democratic citizenship, foreign language learning, and collaborative learning. The results of the research will be expressed at a later time when data have been gathered and analysed.

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The zero-pollution ambition. European main cities urban sound environment analysis

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Noise is considered the second largest environmental cause of ill health in western Europe. Despite the efforts made, the current situation in European cities reflects that the zero-pollution ambition from the European Green Deal vision regarding noise exposure reduction is far away. The tendency shows that noise exposure may continue increasing with a global increase of the analyzed data of 7% in 2017 compared to 2012. The present work reflects on the policies and challenges that the sound environment in Europe is facing, exemplify through 2012 and 2017 data from the European main cities situation regarding population noise exposure and the following actions to improve the city sound environment. An exposition of a series of aspects that may help to change the trend regarding noise exposure and the irresponsible territory consumption practices.

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How implementing SDG 12 in teaching helps students develop prosocial skills?

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The world is witnessing various substantial risks and how ecological and climate changes can affect our daily lives, such as ecological and climate ones. The United Nations has established the SDG17 goals for sustainable development till the year 2030. Governments and organizations were assigned to engage people and individuals in societies to contribute in the maintenance of sustainability. Higher education institutions took part as they are the vital agents for change and enhancing students' prosocial behaviors, by adapting policies and curriculums that the core subject is sustainable development and responsible production and consumption. This study is a systematic review to analyze how universities' implementation of SDG12 helps students develop prosocial behaviors. Findings demonstrated that students' approach to positive environmental actions is due to the activities, campaign and educational models offered by universities. Also, it shows that joining forces with universities can contribute in achieving more goals on a large-scale.

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Recycling, reuse, and longer lasting products

(*Faculty of Education, Aula Magna*) *15:00-15:15h*

Life Cycle Assessment for the Primary Raw Materials Extraction Industry

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Since August of 2019, a small team of researchers at Technische Universität Bergakademie Freiberg have been training students and young researchers on the use of Life Cycle Assessment (LCA) with several software packages called UMBERTO+, GaBi and LCA Open access for the purpose of investigating the environmental impacts of processes along their entire Life Cycle. LCA is not new, since researchers started to develop and expand the theoretical background and the methodology already in the early seventies of the last century, except that LCA studies on the extraction, treatment and management of natural resources are not very common. That is why, in Freiberg, our focus is on processes in mining and in mineral processing, especially with respect to minerals and metals with critical relevance for new technological developments, such as decarbonization, the energy transition and the circular economy.

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Recycling, reuse, and longer lasting products

(*Faculty of Education, Aula Magna*) *15:15-15:30h*

Physical Processing in Waste Printed Circuit Boards Recycling: current state of research

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The article presents and compares the results of metal separation from pulverized printed circuit board waste (PCBs) using physical and physicochemical processing methods. PCBs type FR4 were used for the research, which were ground at cryogenic temperatures using a knife mill. Separation processes for the same feed were carried out using electrostatic and gravitational separation, and flotation. Compared to the other PCB recycling methods, the ones presented in the paper have a lower environmental impact and allow the reuse of both metals and non-metallic parts. The highest efficiency was for electrostatic separation, as a result of which the following products were obtained: 26.2% wt. metal product, 2.8% wt. middlings and 71%wt. a product containing non-metallic parts. The products obtained in this way are easy to use in other processes. A product containing valuable metals can be processed in local metal processing plants, while shredded non-metallic parts can be a good filler for epoxy resin composites. Furthermore, electrostatic separation in comparison to other used methods has the lowest environmental impact because there was no need to use water and complications associated with it. Thus, the technology of PCB recycling proposed in the work is characterized by high efficiency and is environmentally friendly.

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Damage Tolerance Approach in the Concept of Quality Control Workflow of Passive CFRP Strengthening of Reinforced Concrete Structures

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The use of Carbon Fiber Reinforced Polymer (CFRP) is one of the most popular methods of strengthening existing reinforced concrete structures nowadays. Many civil engineering structures (e.g. bridges) are strengthened in this way. Due to the reduction of costs and environmental impact through the decrease of construction waste and lower production of new construction materials (e.g. cement responsible for significant emission of CO_2), it is still economically and environmentally justified to strengthen existing structures rather than demolish old ones and build new ones. After many years of using CFRP strengthening techniques, more and more concerns are dictated by its lifetime durability, gradual deterioration as well as quality assessment of the bond between composite and concrete. Although available manufacturers' design guidelines for nondestructive evaluation strengthened reinforced concrete (RC) structures indicate possible inspection methods, in the practice, they are limited mainly to visual inspection and tap tests. So far, it is not clear if any acceptable level of defect size in FRP-bonded members exists; thus, if any air voids or delamination are detected, the laminate should be replaced with the new one. This process in the performed in situ technically simple tests relies mostly on the worker's perception. The lack of qualitative and quantitative guidelines for acceptable defect levels may lead to conservative conclusions and unnecessary economic and environmental loss. On the other hand, recent studies show that FRP strengthening systems are capable of remain a specific value of member capacity even when some defects exist in the bond. The main aim of this study is to highlight the issue of extending the lifetime of the passive CFRP strengthening system of RC structures by adopting the damage tolerance approach and chosen concept of quality assessment workflow by pushing existing strengthening to its limits, simultaneously maintaining structure in acceptable conditions in terms of safety or serviceability. Facing the fact of the common and massive use of FRP

strengthening over the last three decades around the world, such a new approach in the area of quantitative diagnostic may be considered one of the basic tools for the extension of the life of structures and reducing the environmental impact of the construction sector.

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Recycling, reuse, and longer lasting products

(*Faculty of Education, Aula Magna*) *15:45-16:00h*

Circularity and sustainability of bio-based polymer/natural fiber reinforced composite

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Amidst growing concerns about sustainability of composite materials, the renewed push towards adoption of bio-based polymer/natural fiber reinforced composites (Bio composite) are gaining increasing demands for various applications which are being the environmental and eco-friendly alternative to synthetic composite materials. Hence, the bio based composite development should be integrated in the circular economy (CE) model to ensure a sustainable production that leads to the conception of closed loops in which resources are in the circulation of production and consumption. However, ironically, the environmental sustainability of composite materials itself is still a challenge, due to the difficulty of recycling and reusing its components when the products reach the end of their useful life. In this context, a holistic attainment of sustainability makes it imperative to adapt sustainable practices not only for raw materials but at every stage of the product. Hence, this work provides a detailed exploration of the appropriate processing of natural fiber-reinforced bio-polymer composites and an insight on using recycled bio based composite constituents which could lead to a reduction in material waste and environmental footprints.

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Recycling, reuse, and longer lasting products

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Circular economy policies in the concrete production

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In the present scenario, the concept of circular economy is overwhelming in every sector and it also receives attention to overcome the continuous growth and increasing natural resource utilization. One of the major policies in concrete production is to reduce the cost of concrete without compromising the quality of concrete itself. Researchers are looking to derive a solution for resource scarcity, the usage of wastes from industries without properly polluting the environment, and nowadays it becomes more significant than ever before. This article discusses the circular economy policies that can be implemented for concrete production. One of the best options available to reduce the negative impact generated by the concrete sector is the circular economy concept. This article discusses the lenient views of political, social, and legal features and is vital to integrating the solid issues of technical, environmental, and economic features.

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Recycling, reuse, and longer lasting products

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Resin degradation of end-of-life wind turbine blades to produce useful chemical compounds in the context of waste to resource recovery

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The selection of proper strategies for degradation and useful product conversion of fiber composites is driven by various environmental and economic factors. Recycling end-of-life (EOL) waste of wind turbine (WT) blade composites is a critical challenge for the renewable energy sector because of its complex composition. The focus of this study is to degrade the complex resins of wind turbine blades to produce useful chemical compounds through the oxy-liquefaction technique under subcritical water conditions. Wind turbine blades have various resins including epoxy resins, glass fibers, and carbon fibers, and they are not easy to separate so the recovery of resin as an individual component is not an easy task. The treatment of selected waste material is carried out at the temperature range of 250 to 350ºC with starting pressure of 20 to 40 bar. The effect of varying weight percentages of oxygen, waste to liquid ratio and residence time on resin degradation has also been studied. Production of various chemical compounds including volatile fatty acids and benzene, toluene and xylene (BTXs) and their dependency on the extent of resin degradation have been checked by using analysis of variance (ANOVA) analysis. Identification of the various chemical compounds against different retention times and temperatures in gas chromatography with flame ionization detection (GC-FID) has also been presented. High resin degradation is an identification of the fact that the oxi-liquefaction technique has the potential to effectively treat the wind turbine blades and support the concept of waste to resource recovery.

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Recycling, reuse, and longer lasting products

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Life cycle assessment for sustainable methods and techniques in the Cement production

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Cement production has reached greater heights due to the current scenario of rapid urbanization and infrastructure development. The Cement production accounts nearly 5% of CO_2 (anthropogenic) emissions and from the industrial sector 15% of the global energy accounts for the cement production. Climate change has been relevant due to the cement industry and also natural resource depletion across the globe. Due to these reasons, it is necessary to understand the environmental implications of the cement industry via life cycle assessment (LCA). Hence, the aim of this article is to bring the sustainability assessment of the production of cement by considering social, economic and environmental effects. This study follows the principles outlined by the International Organization for Standardization (ISO 14040:2006 and ISO 14044:2006) to conduct LCA of the cement industry. One tonne of Portland cement is considered as the functional unit. The input data (raw materials, energy, electricity, and transportation) were taken from the previous researches and literature. The output data considering emissions to air were done based on the air pollutant inventory guide books of EMEP/EEA, IIPC and; an AP-42 update of the US EPA Detonation of explosives. This article concludes about the environmental impacts and key environmental hotspots and mitigation measures has been suggested for the sustainable development of cement industry sector including bringing out alternate fuels, optimizing the efficiency of the energy and highlighting the technologies for energy recovery in the future.

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Recycling, reuse, and longer lasting products

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Research on hard drives in the context of the construction of shredding knives in the recovery of rare earth elements

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The publication presents an inventory of waste electrical and electronic equipment (WEEE) equipped with neodymium (NdFeB) magnets, which, when decommissioned, will be able to become a source of REE procurement. These magnets contain Rare Earth Elements (REEs) such as neodymium, dysprosium and praseodymium. Products equipped with NdFeB magnets have been identified: computer hardware, consumer electronics, wind power generators, and electric-powered vehicles. A prospective source of REE acquisition could be HDDs and speakers in laptops and phones, which account for about 10% of the analysed equipment containing NdFeB magnets. A study of the selected WEEE - hard disk drive in terms of material properties was carried out. The following analyses were performed: phase composition studies (XRD), microstructure studies (SEM-EDS), micro-area chemical composition studies (S/TEM) and hardness studies. Based on the studies, the material for the cutting knives of the twin-shaft disintegrator was selected. Three variants of cutting knives differing in the number of blades on the perimeter were developed in Autodesk Inventor 2023. Variants with three, four and five blades were considered. Strength calculations were then carried out using the Nastran plug-in. A force was applied to the cutting knife blades, from which von Mises stresses and strains were determined.

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Recycling, reuse, and longer lasting products

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An insulation panel made from local plant-based lightweight concrete

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Reduction of CO_2 emissions, energy consumption and waste production can be achieved by using building materials with low energy footprint. This research proposes the use of local agri-food wastes, invasive plants and lime or clay-based binders in the preparation of lightweight composites as construction materials. More specifically, the influence of the type and quantity of local plant-based aggregates and local binders on the thermal properties was examined. The final aim is to select the most suitable design of aggregate/binder for the formulation of a Cretan lightweight concrete block ready to be applied in traditional and modern buildings. It has been demonstrated that the most suitable insulation block consists of arundo donax (giant reed) as aggregates and a local putty calcitic lime with natural pozzolan in a binder/aggregate ratio ranging from 1/4 to 1/3. These samples exhibit a thermal conductivity comparable to similar products on the market (0.07 W/m. K ± 0.002).

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Recycling, reuse, and longer lasting products

(*Faculty of Education, Aula Magna*) *17:15-17:30h*

Production of nanobiochar from sewage sludge for the adsorption of Emerging Contaminants (ECs) from water and wastewater

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Biochar is the solid product of biomass pyrolysis. Nanobiochar is a new concept that combines biochar technology with nanotechnology in order to create advanced adsorptive and sustainable materials. This can be achieved by using waste materials as feedstock for nanobiochar production. Emerging Contaminants (ECs) contain of a list of organic pollutants that get increasingly detected in surface waters during recent years, causing harmful effects to the recipient organisms. These contaminants cannot be removed conventionally by WWTPs resulting to the search for efficient solutions to resolve this problem. For this purpose, nanobiochar was produced from sewage sludge combined with two nanomaterials, Graphene Oxide (GO) and Carbon Nanotubes (CNTs). Nanobiochars were physicochemically characterized and then applied as adsorbents for the removal of six organic micropollutants listed as ECs from water and wastewater samples. Results showed that CNTs were the best choice of nanomaterial to enhance sewage sludge by effectively removing at least 80.8% of all contaminants from water and wastewater during the first 5min of contact time, while GO nanobiochars required higher contact times (up to 60min) in order to remove most pollutants sufficiently, except for 2.4D, which was difficult to remove in this case.

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Recycling, reuse, and longer lasting products

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Responsible heritage protection actions

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In recent decades, interest in maintaining and conserving cultural assets has grown and there has been greater investment in the conservation of historical heritage. Developing a good methodology for action is key to guaranteeing adequate preservation of cultural assets. With this in mind, the Spanish Historical Heritage Institute convened a conference in 2002 to try to define basic criteria to guide the different phases of the intervention process in stone materials in all stages of stone conservation: cleaning, consolidation and protection. Carrying out efficient protection of monuments in the traditional way focuses efforts only on how it affects the property, but not on the collateral impact it may have on the environment, or how the effects of climate change may alter its functionality. Thus, a more multidisciplinary test design is needed, with a mandatory laboratory simulation phase under simulated rainfall that represents the increased environmental aggressiveness expected in the near future due to climate change. Hence, water becomes a means to simulate these future conditions, but also a way to explore the effects on rivers and groundwater near the points where the monuments will be treated. Since fresh water is one of the resources that is expected to become scarce in the short term, we intend to carry out responsible tests that take into account both aspects: saving water use and water pollution. Combining the conservation of monuments and environmental responsibility, it will be shown how it is possible to carry out research to achieve a natural product that serves as a sustainable coating for monuments of stone material that is durable but that reduces the environmental impact both in the selection of the product and in the experimental phase, as well as in its operation after application.

Oral sessions – Friday 21st October 2022, 9:30-10:45h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *9:30-9:45h*

Religious slaughtering, could be labelled 'green'?

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The present communication reviews the arguments put forward by the Court of Justice of the European Union (Grand Chamber) in its judgment in the Case C-497/17. The Court has interpreted if the applicable rules of EU law, deriving from, inter alia, Article 13 [TFEU] and Regulations Numbers 834/2007, 889/2008 and 1099/2009 allows the use of the European "organic farming" label in relation to products derived from animals which have been slaughtered in accordance with religious rites without first being stunned, reflecting on the conflict between slaughtering halal and uncompromising standards of animal welfare. The judicial process was initiated in the context of an action brought by the association Œuvre d'Assistance aux Bêtes d'Abattoirs (hereinafter, 'OABA') alleging misuse of powers against the French certification body. In its final decision, the Grand Chamber understands that animal welfare is a priority and must prevail over the other issues.

Oral sessions – Friday 21st October 2022, 9:30-10:45h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *9:45-10:00h*

Can the fate of the non-avian dinosaurs help us to predict the consequences of the ongoing biodiversity crisis?

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The ongoing biodiversity crisis has urged the scientific community to concentrate more research efforts on the mechanisms underlying the mass extinctions that have repeatedly affected our planet in deep time. This work implements a novel combination of palaeoecological and statistical routines to assess disruptions in the trophic architecture of non-avian dinosaur communities across the latest Cretaceous (83.6-66.0 Mya) of North America. Using these extinct beasts as model organisms, this work aims at increasing our ability to predict the susceptibility of ecological communities to extinction events under different levels of environmental disturbance. There was a trophic shift in the large, bulk-feeding herbivorous ornithischians and theropod carnivores during the Campanian-Maastrichtian transition that led to a simplification of North American terrestrial food webs several million years before the asteroid impact. Their disappearance during the Maastrichtian (72.0-66.0 Mya) made terrestrial communities more prone to extinction in the aftermath of the Chicxulub impact, which suggests that conservation schemes should pay special attention to keystone species in present-day food webs. In conclusion, palaeoecological transitions in the fossil record provide a valuable source of information for predicting the potential consequences of large-scale disturbances on contemporary biodiversity.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *10:00-10:15h*

Teacher's perceptions of fisheries ecolabels and game-based learning activities in the framework of Education for Sustainable Consumption

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Socio-environmental sustainability in oceans implies that marine fisheries should be sustainable, and the Education for Sustainable Consumption could promote sustainable artisanal fishing. Our survey on elementary school teachers' perceptions on fish ecolabels, including environmental and social values of sustainable fisheries, showed positives opinions. However, most of them do not read the labels information of products in fishmongers and supermarkets before making their purchases. With the aim to provide teacher resources on sustainable fisheries, an educative experience linking Environmental Education, Education for Sustainable Consumption, and knowledge about small-scale fishing is proposed. This didactic sequence includes explanatory activities, reflection and debate on responsible consumption, sustainable fisheries and ecolabels, as well as game-based learning activities. This intervention will promote students to be aware of de concept of sustainable fisheries concept, training them towards responsible consumption through critical and supportive attitudes related to Sustainable Global Goals 12 (ensure sustainable consumption and production patterns) and 14 (conserve and sustainably use the oceans, seas and marine resources).

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *10:15-10:30h*

Ecological risks of post-artisanal mining sites and their sustainable cleaning techniques

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This study assessed the residual contaminant load of three groups of artisanal gold mining (ASM) impacted lands, thereafter, phytoremediation techniques using *Jatropha curcas*, *Manihot esculenta* and organic amendments were used for mitigation. A total of 110 soil samples from 30 ASM sites were investigated for their total contents of Cd, As, Pb, Hg, Zn, Fe and Al. After sample digestion, ICP-MS was used for content determinations. Using activated neem seed extracts (NE) and poultry manure (PM) at different application rates, the phytoremediation potentials of *Jatropha curcas* and *Manihot esculenta* were assessed for 270 days after planting. The obtained data were analyzed with SPSS statistics 28 for the ANOVA. The results indicated mining spoils were suppliers of toxic elements in the soil however, their distributions per contaminant varied based on the properties of the ore materials mined. As a result, mine spoils created the processing of oxide and underground rock ores supplied contents of As, Fe, Al, Cd and Zn much more than alluvial mining sites and above tolerable threshold levels. Both *J. curcas* and *M. esculenta* exhibited phytostabilizing potentials as larger portions of absorbed elements were stored in their root organs. However, the application of a 25% mixture of neem seed extract and poultry manure or 25% poultry manure only (w/w) to soils

helped in the uptake of 19- 38% and 10.4- 45% more potentially toxic elements in *J. curcas* and *M. esculenta*, respectively than in their control treatments.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *10:30-10:45h*

Study on the soil formation process on the mining waste dumps from Jiu Valley (Romania). A case study

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The present paper is in fact a continuation of a research effort started approx. 16 years ago, and whose main purpose is to follow the process of transformation of rocks from coal mining waste dumps into a fertile soil. Thus, during 2022, a new sampling campaign was carried out from the Petrila waste dump, which was later subjected to laboratory tests in order to determine the main characteristics that define the soil. These new data can be seen as the result of a periodic monitoring process and they complement the systematic study carried out between 2006 and 2011 (this study also included research related to the ecological succession of the phytocoenoses present on the Petrila dump). According to these latest analyses, the soil formation process is an active one, relatively slow, being highlighted by the increase in the content of nutrients and organic substances in the composition of the dumped material compared to the previously determined concentrations, as well as by the increase in the total and physiologically useful thickness of the soil layer. The results of this study are important for the next period, when the last 4 active dumps in Jiu Valley will be put into conservation, providing relevant information regarding the pedogenesis process that takes place on these dumps, under the exclusive influence of natural factors.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *11:30-11:45h*

Multitemporal optical remote sensing to support forest health condition assessment of Mediterranean pine forests in Italy

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Forests provide many services to society but climate change, biotic, and abiotic forest disturbances are altering ecological systems. Among these, Mediterranean pine forests, distinctive environmental elements of the Italian coastal area for both natural and historical reasons, are particularly susceptible. As evidenced by numerous wind damages, drought stress, and more recently Toumeyella parvicornis infestation in central Italy. On the other hand, there is a lack of reliable and spatialized data on the spread of infestations and stress states. In this context, their monitoring using all available sources of information is essential. In this study, we used Sentinel-2 optical data to monitor the health status and damage that occurred to Mediterranean pine forests in Italy in recent years (2018-2022). In terms of damaged area, we identified a growing trend over the years (4.5% of Italian Mediterranean pine forests in 2018, 4.0% in 2019, 6.4% in 2020, and 14.6% in 2021), with an abrupt increase in 2022 (24.2%). While our model was calibrated using reference data available for a Mediterranean pine forest study area of about 1000 ha in central Italy and 80% accuracy was reported, more exhaustive reference data should be used for providing solid estimates. On the other hand, Sentinel-2 data proved to be a relevant source of information, pointing to a very serious situation for Mediterranean pine forests.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *11:45-12:00h*

Web application based on Sentinel-2 satellite imagery for water stress detection and monitoring in poplar plantations

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Clonal poplar plantations under conditions of water stress are more susceptible to pests and diseases, in addition to having lower growth rates than in optimal conditions of water availability. Likewise, water management is essential to guarantee responsible and sustainable wood production, with a minimum water footprint. The aim of this paper was to develop a user-friendly online system based on satellite imagery to detect and monitor damages caused by water stress in poplar plantations, so it could be used by the poplar owners/managers without previous knowledge of remote sensing. PoplarAlert is a free online web application which was developed using Sentinel-2 MSI imagery, Google Earth Engine, Python. It allows the user to obtain, through the application, clear and immediate information on the probability that damage due to water stress has occurred (information in the form of an image, graph, vector or table). In addition, this tool allows the temporary reconstruction of a damage that is detected (to go back in time and try to identify the trigger). The results of testing it in two different plantations confirmed the capability of PoplarAlert to detect water stress once there was some leaf loss and/or drier/yellower leaves still on the tree (previously or during the leaf loss).

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *12:00-12:15h*

Mapping and estimation of carbon dioxide storage in forest plantations. The contribution of the Sentinel-2 time series in increasing estimates precision

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Forest restoration activities and tree plantations play an important role in combating global warming. On the other hand, quantifying their carbon storage is a challenging task due to very short rotations and the effort and costs required for field analysis, often in remote and hardly accessible regions. In this context, remote sensing combined with new cloud computing platforms offers unprecedented opportunities for monitoring tree plantations globally. In this study, we implemented and demonstrated over a 20-ha tree plantation in Guatemala an approach that exploits Sentinel-2 imagery time series derived metrics and cloud-free composites for mapping carbon storage. Ground data were collected over 20 plots (10-meters radius) to train and validate our model, which performance resulted in high (R^2 =0.69, RMSE=35%). Plus, we estimated the amount of carbon stored in the study area and the relative confidence intervals. Using exclusively the ground data, we estimated the average net equivalent CO_2 as 4.95 Mg ha^{-1} ± 0.9 Mg ha^{-1}, with a confidence interval of 95%. Nevertheless, exploiting the herein presented model and statistical procedure, the estimate was much more precise and the ratio between the variances of the design-based and the model-assisted estimates was 7.1, meaning that, by using remote sensing data, it is possible to reduce the ground sample size by a factor of 7.1 while obtaining estimates with the same precision of those do not exploiting remote sensing data. This is a crucial point for meaningful reducing the

effort and the cost required for collecting data on tree plantations while still obtaining statistically rigorous estimates.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *12:15-12:30h*

AppPopuli: Web application for real-time damage report in poplar plantations using citizen science

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AppPopuli is a citizen science project developed by a multidisciplinary team, in the fields of forest health and computer science. The core of the project was to develop a web application that allows both foresters and ordinary citizens to inform, in real-time, about damages in hybrid poplar plantations (*Populus* spp.) caused by pests or diseases. The damage report is done individually by the user through a form that they fill in with information related to the damaged tree, such as, for example, the name of the pathogen causing the damage (if known), the geographical location, photographs, etc.; so that this data is stored in a database. The database aims to monitor the status of poplar plantations and provide feedback to the app users about the damage they have reported. On the other side, the application also includes a help section with information about the pests and diseases that could damage poplar trees, so that non-experts in the field are able to identify damages found in poplar trees correctly; and an explore section with a table that contains some of the data of the reports sent by the users with their location marked on a world map. The application is focused on its use using mobile devices

(but not limited to), which has been kept in mind while designing the user interface in order to guarantee a good user experience, no matter the device you are using and the size of its screen. This application will contribute to sustainable and responsible wood production, providing more resilient poplar plantations and promoting the early control of potential pests and diseases.

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Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Aula Magna*) *12:30-12:45h*

Near-real time forest health monitoring using ecophysiological sensors and the Internet of things (IoT). A study case for water stress in sustainable poplar plantations

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Having a damage/stress detection and monitoring system in semi-real time will allow a quantitative improvement in the poplar (*Populus* spp.) sector, from the point of view of sustainable and responsible wood production. The aim of this work was to develop a near-real-time system for monitoring water stress in poplar clone plantations using the sap flow density measured by ecophysiological sensors and transmitted by the Internet of Things (IoT). Results showed a high correlation between the sap flow density and the growth in diameter measured weekly in the field for trees under water stress (Pearson's r >0.81) and confirmed the suitability of this variable as an early warning indicator of damage to poplars due to water stress. In an early warning system for water stress, an average sap flux density value of 0.7-0.8 between 12 pm and 3 pm could be used as a threshold, since sap density fluxes under that value have showed weekly growth values of zero or close to zero.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *9:30-9:45h*

Impact of the Operation Conditions on the Reverse-Water-Gas Shift Reaction

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The reverse water gas shift (rWGS) reaction represents a key technology to realize an end-to-end power-to-liquid process chain. In this work, experimental tests of a nickel catalyst are reported. The influence of operating temperature (650-950 °C), pressure (ambient pressure up to 6 bara) and gas hourly space velocity (6000-40 000 h^{-1}) on the conversion of CO_2 and hydrogen is investigated. The results of this experimental evaluation show that the rWGS reaction favors high temperatures and low pressures. Thermodynamic equilibrium is approached with the used catalyst. Higher gas hourly space velocities favor the rWGS reaction and inhibit methane formation.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *9:45-10:00h*

Improving sustainability in Industrial Plant Construction Available tools and methods

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In the current scenario, sustainability is a factor that is becoming indispensable in the engineering and construction industry as a basis for decision- making during the life cycle of projects, from the engineering phase, to the construction management phase and finally for asset life management. To achieve the desired impact, which is the drastic reduction of pollutant emissions, a holistic vision needs to consider all the different elements of an engineering and construction of an industrial project. Among the currently available options to include the concept of sustainability in industrial plant construction projects, this work explores the contributions of Virtual Design and Construction (VDC), Integrated Project Delivery (IPD), Lean Construction, DfMA and Modular Construction. VDC, one of its best known elements is BIM (Building Information Management), provides a collaborative work environment, hence contributing to the creation of synergies and the early resolution of interferences between different systems, what links perfectly with contractual strategies such as IPD. VDC provides also the tools to design entire industrial plants in 3D and to combine such 3D models with the execution program to create virtual construction sequences (4D). Such simulations enable the coordination of different activities and the application of Lean Construction techniques, such as Lean planning or Just in Time to name a few. With regard to the prefabrication and industrialisation of components and their effect on the sustainability of construction, the possibilities and interactions between DfMA and VDC are enormous.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *10:00-10:15h*

Comparative Exergy Analysis of Heat Pumps for Heat Recovery Applications

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Heat pumps have a multitude of applications and therefore there are many types of heat pumps. In one peculiar application heat pumps proved to be very effective for low grade waste heat recovery. Several criteria can be considered for choosing a heat pump, such as application scope, coefficient of performance, etc. Sometimes these criteria are not enough, and some more must be found. The paper suggests the use of comparative exergy analysis in order to choose the heat pump that best suits the application for which is intended. Exergy analysis is a powerful tool that allows us to analyze in detail the processes that are taking place in a heat pump, enabling us to choose knowingly between different types of heat pumps the one that best suits our application. Two new criteria for choosing a heat pump are suggested: cycle compression work and environmental impact of the refrigerant. Exergy analysis shows that the choice of the vapour compression heat pump, purely from COP point of view is legitimate but, the choice of the gas pump can be rightful due to smaller cycle compression work and refrigerant used, which in case of gas compression heat pump is air, neutral in terms of environmental impact.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *10:15-10:30h*

Consumption behaviour in the context of sustainable energy: theoretical approache

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Increasing production and consumption have a growing environmental impact. The challenge for all countries is to decouple economic growth from the environmental impacts of consumption, resource use and waste generation. The economic sectors with the highest environmental impacts are electricity, gas and water supply, transport services and agriculture. It is there-fore becoming important to improve energy efficiency and invest in innovative and resource-efficient technologies, recognising the need to change consumption patterns and behaviours. The Sustainable Development Strategy focuses on sustainable production and consumption. Although historically the focus has been on production and the associated environmental problems and solutions such as pollution control, cleaner production and recycling. Production and consumption as interdependent indicators have only recently come into focus as researchers have realised that production and consumption are highly interrelated. Sustainable Development Goals have stressed the importance of promoting consumption and production that have the least possible impact on the environment and are able to meet the basic needs of humanity.

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Industry 4.0

(*Faculty of Education, Salón de Grados*) *10:30-10:45h*

Energy Saving Technology Integration into the Transport Sector; the Influence of Years of Driving and Gender on Electric Vehicles

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The study sought to investigate if gender and years of driving can be used to predict whether electric vehicles can fully be integrated into the transport sector. The transport sector was the center of focus as it is connected to almost all production branches. The use of electric vehicles was one of the energy-saving technologies identified. The paper discusses five different types of electric vehicles: the hybrid electric vehicle, the plug-in electric vehicle, the plug-in hybrid electric vehicle, the fuel cell electric vehicle, and the ultracapacitor electric vehicle. Drivers around car dealerships, parking lots, hotels, supermarkets, shopping malls, and bus service centers in Lithuania were recruited using random sampling n=100. Data was collected using a simple questionnaire that was provided to the sample population. The methods of data analysis included descriptive statistics, chi-square, and predictive analysis. The results indicated that years of driving affect people's preference for electric vehicles over traditional combustion engine vehicles. There was no significant relationship between gender and preference for electric vehicles.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *11:30-11:45h*

Scale model showcase to drive policy making via IoT composite indices and low-resource equipment at the edge of the computing continuum

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This paper summarizes a demonstration of innovative IoT assumptions about: (a) usage of composite indices to drive sustainable environmental policy making in maritime port-city domains, (b) implementation of a full-fledged IoT architecture focused on the optimization of the edge computing through efficiently distributing its components the across the edge-to-cloud computing continuum and (c) easy, quick deployment of low-cost equipment to realize the two previous points. The demonstrator uses scale-models and data on the environmental field simulating a maritime port. The demo consists of running in real time various sensors completely leveraging low-resource equipment at the edge of the edge-to-cloud computing continuum. The resulting composite index could be very useful for the authorities to perform proper actions with the purpose of reducing the environmental impact of these nodes and for the city population in terms of transparency, since a composite index provides clearer information than a huge amount of raw data.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *11:45-12:00h*

Introduction of Integrated Resource Management for Sustainable Development of Industries

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The transformation of the energy market towards a decarbonized economy as well as the increased dynamization of the corporate environment in combination with easier accessible information on company-internal processes as a result of digitalization require a holistic view of a firm's resources. This paper presents the approach of Integrated Resource Management (IRM) as an instrument of strategic corporate alignment using the practical example of carbon neutrality. After a review of the development of the concept of resources in context of corporate management systems, a potential matrix is applied to structure substitution alternatives for gas supply. In addition, the subprocesses of bundling and leveraging a firm's resources are described in the context of gaining a competitive advantage as a result of an Integrated Resource Management approach.

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Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *12:00-12:15h*

Validation of double wall reactor for direct biogas upgrading via catalytic methanation

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Actively cooled fixed bed reactors for catalytic methanation provide the opportunity for stable operation as temperature hotspots and thermal runaways occur in existing multi-stage fixed bed set-ups in commercial scale. This short paper reports on the experimental investigation of three cooled double wall reactors for direct biogas upgrading via catalytic methanation. The inner diameter (14, 18 and 27.3 mm) of the reactors has been significantly reduced to evaluate the improvement of the thermal management. The reactors have been tested in an existing pilot plant under varying operation parameters such as pressure and gas hourly space velocities (GHSV). As validation parameters, the CO_2 conversion rate and the measured temperature profile in the catalyst bed are considered. The thinnest reactor with an inner diameter of 14 mm performs best regarding the CO_2 conversion rate at all operating points, and the CO_2 conversion ranges between 99.7 and 97.6% at GHSV of 4 000 and 20 000 h^{-1}, respectively. Also, the maximum catalyst temperature of 510°C is not exceeded at high catalyst loads (15 and 20 000 h^{-1}) to ensure long stability and activity of the catalyst. In comparison, in a reactor with an inner diameter of 27.3 mm far lower conversion rates (98.5% and 88.5% at 4 000 and 20 000 h^{-1}, respectively) can be achieved in one reactor stage while the maximum measured temperature in the catalyst bed lies around 600°C. The most favorable reactor design for biogas upgrading at high catalyst loads corresponds to the reactor with the thinnest inner diameter. Beside well performing, a thin cooled reactor is characterized with a reduced system complexity and low investment costs. Furthermore, an easy scale up is possible while ensuring simplified operation.

Oral sessions – Friday 21st October 2022, 11:30-13:00h

Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *12:15-12:30h*

Autonomous Smart Electric Vehicle integrated into a Smart Grid type System

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This paper briefly presents the creation of an intelligent electric vehicle with self-driving capabilities that can be integrated into both the new Smart Grid and Smart City concepts, as well as its use as a prosumer element in an electricity supply network. The realization of a small electric vehicle obtained based on a conversion of its thermal engine into an electric engine, the integration of communication systems based on the LoRa network and the use of LiDAR sensors for the purpose of mapping an area of interest is briefly presented. A concept for the development of an electricity supply system with the help of photovoltaic panels installed in the city of Petroșani is also presented. The entire designed system, even if part of it is only at a conceptual level, represents a starting point in terms of the development of integrated systems around an autonomous electric vehicle with autonomous driving capabilities that can be considered truly 100% non-polluting through given the fact that the vehicle's batteries will be powered by renewable sources.

Oral sessions – Friday 21st October 2022, 11:30-13:00h

Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *12:30-12:45h*

Wireless industrial access control systems for autonomous transportation

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The digitization of industrial assets enables automation, generating added value to manufacturing processes. Digitalization is exemplified by the use of Wireless Sensor Networks (WSN) to monitor mobile robots and personnel in the industrial plant. Based on this infrastructure, the authors propose a novel access control system without the need to interact with any equipment. Hence, the implementation costs are reduced because the same Cyber-Physical Systems (CPS) technologies are reused, preventing the implementation of complementary equipment for both operators and mobile robots. In addition, the security of the wireless protocols has been analyzed by proposing a robust and scalable solution. Therefore, the accessibility to restricted areas is improved by reducing the authentication time compared to other technologies, especially for mobile robots.

Oral sessions – Friday 21st October 2022, 11:30-13:00h

Cleaner energy and cutting-edge clean technological innovation

Industry 4.0

(*Faculty of Education, Salón de Grados*) *12:45-13:00h*

Industrial applications of the Internet of Things

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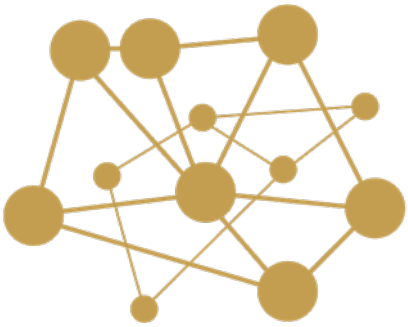
In the age of Industry 4.0, a substantial concern for modern manufacturing organizations in optimizing production processes under an Internet of Things (IoT) framework is noted. Moreover, given the significant volume of production, energy efficiency is an inevitable issue. To a great extent, improving production performance depends on the development of new technologies. As a result, this research targets to conduct a research review for the implementation of industry 4.0 technologies in continuous manufacturing. While there is a significant amount of research on batch manufacturing and industry 4.0, continuous manufacturing is less addressed in these scientific works. In an attempt to fill this gap, we try to understand the transition from batch processing manufacturing to continuous processing manufacturing within certain industries, emphasizing the benefits of industry 4.0 relevant to the industry and sustainability. Another crucial part of this study is identifying open issues and challenges of industry 4.0 infrastructure in continuous manufacturing. For such reason, we developed two research questions that we will try to answer during this work. The first one is which are the technologies being implemented as part of industry 4.0 in continuous manufacturing and the second one, does the implementation of such technologies in continuous manufacturing led to energy efficiency improvement.

POSTER PRESENTATION SESSION



Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

The inextricable link among climate change, pandemic, migrations, and geopolitics: how Artificial Intelligence can help us

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The theme of sustainability transition has been the subject of an increasing number of research in recent years. This contribution aims to highlight the close links existing between several issues (that are apparently distant from each other, but all related to sustainability) and Artificial Intelligence (AI). In particular, we want to underline the interdependencies – and possible developments – among climate change, pandemics, migration, and geopolitics, in light of the new discoveries of AI.

Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

Fair trade and the Sustainable Development Goals: an opportunity for sustainable production and consumption

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The paper presents what has been labeled Fair Trade certification and how it can aid in the economic growth of communities. The aim of this paper is twofold: On the one hand, to assess the impact of Fair Trade on developing countries and its relationship with the Sustainable Development Goals. This shall be done through a review of the literature, using as a representative example the NGO Fairtrade L.O. International. On the other hand, to try to understand the perception of this certification among consumers, since trust in the effectiveness of Fair-Trade Standards is key to the purchase of its products. The conclusion presents evidence arguing that Fair Trade dynamics can in-deed foster sustainable and fairer production, more consistent with the dignity of every human being. Thus, it has the potential to impact positively developing countries, firms seeking to fulfill CSR standards and -given the necessary trust in these organizations- address the niche for consumers in developed economies seeking sustainable and humane production.

Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

Automation of the assessment and diagnosis process in rehabilitation: a proposal to reduce costs and optimize the health care system

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The standardization of assessment processes leads to increased efficiency in healthcare practice. Fundamentally, this is due to the fact that it facilitates the application of appropriate clinical reasoning processes and bias-free decision making. As a result of this situation, it is necessary and very useful to develop a multiplatform application to guide physiotherapists in the assessment process as a strategy to facilitate clinical reasoning in rehabilitation. This program will show in an organized way all the validated clinical tests and tests suit-able for physiotherapy assessment, will record and compile all the relevant results and will facilitate the selection of the physiotherapy diagnosis. The present project aims to transform a procedure that is currently performed manually (storing all the information on paper and consuming time and resources of health personnel), into a fully automatic and digitized process thanks to the use of disruptive technologies such as computer engineering and engineering and data science through artificial intelligence techniques.

Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

Sustainable alternative to antimicrobial uses: new probiotics

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Indiscriminate use of antimicrobials is linked to a hazardous increase in antimicrobial resistances (AMR). Global concern in AMR has restricted anti-microbial use through new tight legislation and research on new sustainable alternatives is needed. Probiotics with their ability to positively regulate the growth of beneficial bacteria of the intestinal microbiota are proposed as a solution to this problem. The aim of this study was to isolate and characterise the probiotic potential of 44 lactic acid bacteria (LAB) obtained from sow's colostrum and milk. Two candidates were selected after determining the AMR profile in this collection for further in vitro assays: a *Lactiplantibacillus plantarum* (LA-34M) and a *Loigolactobacillus coryniformis* (LA-10). Their antibacterial activity was demonstrated against three different enteric pathogens (*Escherichia coli*, *Salmonella* spp., and *Clostridium perfringens*). Adherence test were performed using the epithelial cell line IPI-21, where La-10 and La-34 showed highly adherence to cell culture (64% and 68% respectively). Furthermore, an invasion assay against *Salmonella* Typhimurium demonstrated that booth strains were able to reduce significantly ($p<0.05$) S. Typhimurium invasion after 1 hour and 2 hours of incubation. These results show once more the interest of LAB in pathogen control. Further in vitro and in vivo assays will allow to determine the commercial potential of these two isolates.

Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

Health, habits and responsible and sustainable consumption

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Natural resources are essential for human well-being, quality of life and health. Current consumption of these resources is disproportionate, with a markedly commercial character. The need arises to change the current paradigm of consumption towards a responsible and sustainable consumption in line with Sustainable Development Goal (SDG) 12. Thus, from the Ponferrada campus (University of León), under the Eureca Pro project, a series of initiatives based on sustainable education through learning based on practice have been developed. The main objective was to raise awareness and sensitise the general population about those behaviours that allow us to achieve the goals set out in SDG 12 in relation to healthy lifestyles, making known sustainable alternatives that benefit our quality of life. Three workshops and a community activity addressed responsible consumption in relation to healthy nutritional habits and the use of clothing and accessories. From the point of view of the university as a healthy environment, a promoter of health, through the revitalisation of the local environment and its economy, the focus was on education, awareness and empower-ment, key elements for a more sustainable development of societies and economies. It is necessary to carry out more programmes aimed at the acquisition of knowledge and the development of attitudes and skills that allow people to decide about their future in a conscious and responsible way, as well as the execution of these decisions based on responsible, sustainable and healthy consumption.

Poster session – Friday 21st October 2022, 10:45-11:30h

Smart and healthy societies

(*Faculty of Education, Hall*)

Unconscious and conscious aspects of healthy food consumption: a neuromarketing and artificial intelligence approach

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Consumers' unconscious perception of packaging is essential, especially regarding food products where people usually have to choose among relatively similar products. In addition, this perception can be affected by the opinions of other users published on social networks. Researchers must set new goals to better understand user behavior through the information they have at their fingertips, and which influences them. The application of neuromarketing and artificial intelligence techniques to packaging has recently gained considerable popularity both, in academia and practice. With the combination of these methodologies, this study explores how people process and communicate healthy food products, and how people's thoughts and behaviors are informative to other users when it comes to understanding their consumption patterns. Two studies have been carried out. The first one with an eye-tracking technique, in which the attention of 20 participants has been analyzed through first fixation and fixation duration metrics. The second study is based on 448 comments from users who have posted their opposition on the social network Instagram. The results obtained show, on the one hand, that healthy statements in food packaging attract unconscious attention, and on the other hand, that healthy claims on food packaging are not enough to achieve consumer satisfaction after purchasing the products. Our study is one of the first to analyze how people perceive unconsciously and consciously healthy products, and how they talk after trying them.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Reducing Food Waste in Supermarkets with Machine Learning

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Around one-third of produced food is wasted, which is almost 1.3 billion tons of food per year, affecting the world economically, environmentally, and socially. Over the years, different solutions for food waste have been developed; however, machine learning within this area has not been sufficiently explored. The food rescue process is very time sensitive since the food can be close to turning rancid, so forecasting the supply of food to be donated could significantly increase the amount of food being rescued. Our objective is to optimise the use of food and reduce food waste in supermarkets. We propose a framework to predict the amount of expiring products donated with machine learning models. In the paper, a first test of the framework, using simulated data, is presented, showing that the Support Vector Regression would be the most appropriate machine learning model for the framework, giving a score of 0.732. While the paper shows that the framework can generate valuable results, the difficulties with applying it to the real world lie in the data acquisition phase. Supermarkets are private companies that might not be willing to share their business data, which is a problem for future research.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Biodeposition of diatoms in recycled aggregates

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This work studies the behaviour of diatoms in artificial culture environments and analyses the biodeposition of diatom frustules in different sizes of mixed recycled aggregates. In order to be able to use this biodeposition as a sur-face treatment and improve the properties of this material for its effective use in recycled concrete. Surface analyses show that the density of diatoms in biofilm formation depends on the aggregate size, being better in smaller aggregates of 4-6.3 mm diameter. However, the diversity of diatoms is higher in aggregates with fractions of 8 to 12.5 mm. The combination of these tests demonstrates that diatom biodeposition is feasible in artificial environments for possible use as a protective surface treatment of cement-based building materials.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Influence of ground PV glass addition on selected properties of geopolymer mortars

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The Alkaline Activated Binders are a hope and a necessity to reduce the carbon footprint of the building materials industry. Many waste and recycled materials can be reused. In our work, we used activators and geopolymerization precursors: slag, waste concrete, metakaolin and glass from photovoltaic panels. We added a little glass, 1.1%, but even this amount has an impact on the microstructure of the mortar. The porosity decreased and the strength increased with the addition of the pulverized glass from the photovoltaic panels. A low Si/Al ratio, around 1, of the mortars cured in room conditions allowed to achieve compressive strength, around 12-14 MPa, open porosity was around 20%. The compressive strength of the geopolymer paste is slightly low-er than that of geopolymer mortars. Permeability of mortars without glass in-creased almost 3 times. Phases changes after 2 and 4 months focused on strong carbonation reactions, what entitles to draw the conclusion of double decarbonizing properties of geopolymers.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Increasing the elastic properties of gypsum materials by reinforcing with terephthalate polyethylene (PET)

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The paper studies the possibility of using strips obtained from plastic bottles through mechanical processes, which by creating nets from this material could be armed and cast in three samples. The paper presents the mechanical tests that were carried out on the three gypsum samples, one without insertion and two with one and two layers of insertion. The values obtained as a result of the mechanical process of breaking by bending demonstrated that the PET reinforcement sample increased its elasticity. The mechanical recycling of plastic bottles transformed in sheets can be used in increasing the elasticity coefficient of gypsum based construction materials in the future.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Research on the valorization of green sludge resulting from the manufacture of sodium dichromate in Romania

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The Târnăveni Chemical Plant was a inorganic chemical plant in Romania. In the good old days, even 6,500 employees worked here. When it was productive, the Chemical Plant produced a lot of inorganic products such as: sodium bichromate, potassium bichromate, barium salts, chromium salts, or zinc oxide. In 2002, the plant was closed and taken over by AVAS. The sodium (potassium) dichromate manufacturing process results in a tailings called green slime. The tailings deposited in the landfill are strongly contaminated with dichromate ion, as a result of the process of manufacturing chromium salts. This ion, according to the statistics, is found in the material in a concentration of 1.73 - 2.20%. This concentration is enormous, taking into account the existing environmental protection regulations. The present paper presents the initial phase of research regarding the removing of this waste.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Investigating the relation between Raw Materials and Climate Change in the Literature

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Raw materials are essential for the green and digital (twin) transition society needs to accomplish to reach climate targets and neutrality by 2050. This is because they supply renewable energy and digital technologies allowing cli-mate-resilient development pathways. On the other hand, the extraction and processing of raw materials contribute to GHGs and therefore to climate change impacting the environment. The author explores the controversial discussion on the topic of raw materials and climate change in the literature on Web of Science and Google Scholar from 1900 to the present. Literature review, bibliographic coupling and natural language techniques reveal that the raw materials and climate change nexus is a current topic with over 57% of the literature being published between 2018 and the present day. Furthermore, it relates to interdisciplinary re-search and the interconnectedness of different disciplines and sectors. Therefore, a systemic approach is suggested when investigating this topic. The literature highlights that even though a transition to a renewable energy system will be mineral intensive, it is feasible to enforce resulting in reduced GHGs emissions when compared to fossil fuel-based scenarios.

Poster session – Friday 21st October 2022, 10:45-11:30h

Recycling, reuse, and longer lasting products

(*Faculty of Education, Hall*)

Innovative treatment of municipal sewage sludge using hydrothermal carbonization and nutrient recovery technologies

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Phosphorus (P) is an essential and at the same time critical resource, as there are barely any available reserves in the European Union, which means that there is a dependence on imports from non-EU countries. In these countries, there are critical working and environmental conditions for which social responsibility must be taken. To address these challenges, municipal sewage sludge has to be utilized since it has a huge potential to produce sustainable P-fertilizers. Hydrothermal Carbonization (HTC) is an energy-improved treatment of sewage sludge and enhances the dewatering properties. The remaining process water contains a significant nutrient content, especially nitrogen (N) and phosphorous (P). For a future project, the recovery potential of P was investigated for Germany, Austria and Switzerland (DACH region). The forecasted P recovery potential in the DACH region until 2030 covers 25 % of the annual P demand and the environmental impact due to the conventional industrial production of P fertilizer could be reduced dramatically (up to 63 t of CO_2 emissions can be saved per year). To identify the sustainable development goals (SDGs) which are primarily addressed by the project, the following question was formulated: What effects does the technology have in terms of sustainability (social, ecological, economic)? The investigation showed that SDGs 8, 11, 12, and 13 are mainly focused. The investigations serve as a basis for a future project, which is shortly introduced in this work, where the nutrients, as well as heavy metals, will be recovered by an innovative combination of three novel processes.

Poster session – Friday 21st October 2022, 10:45-11:30h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Hall*)

Plastic pollution and the need for responsible plastic consumption and waste management

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Plastic pollution is a global anthropogenic threat to all environmental compartments. The current plastic waste management practices include recycling, composting, and incineration for energy recovery or deposition in landfills, resulting in leaks into the natural environment at each stage. Interdisciplinary re-search and innovation perspectives in policymaking connecting the different actors in the plastic value chain would ensure the closure of material loops, safe-guard human health, reduce climate change impacts, and promote biodiversity. This short paper provides an overview of the pervasive nature of plastic waste and microplastics in the natural environment, outlining a harmonious, systematic, and collaborative approach to tackling the plastics value chain while offering a potential circularity of material flows aligned with the principles of a circular plastic economy. Finally, a case is made to incorporate sustainable, restorative, and regenerative plastics production, use, and after-use as one of the unique in-dicators of Sustainable Development Goal 12. Ensuring sustainable consumption and production patterns in the plastics landscape will demand the development of product standards and a holistic assessment methodology to guide the design of circular products, services, and business models.

Poster session – Friday 21st October 2022, 10:45-11:30h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Hall*)

Contrasting compositional and abundance patterns in zooplankton communities between mountain and lowland ponds

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Understanding the patterns and mechanisms underlying community structure and composition along altitudinal gradients is key for modern ecology and biogeography; indeed, this research agenda can provide a useful toolbox to forecast the consequences of climate change on present-day ecosystems. However, spatial variation of zooplankton communities at different elevations has rarely been addressed, and most available research on aquatic systems has focused on species richness only. Here, we aim to study the effect of elevation on zooplankton communities, both in terms of species composition and abundance. NMDS analysis was performed to examine community-level patterns in the ordination space between plateau and mountain ponds. In addition, we used SIMPER to assess whether these ponds differed in the composition of zooplankton communities and identify species groups that contributed to biotic dissimilarities between mountain and lowland regions. Mann-Whitney's tests were run to verify the existence of statistical differences in the total abundance and relative abundances of constant, rare and accessory species between plateau and mountain ponds. Our findings illustrate a clear patterning in zooplankton community composition and abundance between mountain and lowland ponds in a geographically extensive area of the Iberian Peninsula. These contrasting patterns were correlated with a set of environmental features that vary concomitantly along altitudinal gradients (e.g., mean annual temperature, ionic content, nutrient concentration and the development of dense aquatic plant stands). Accessory species contributed most to total abundance at increasingly lower elevations, although small-sized rotifers were the dominant component of zooplankton communities in both pond types. These

results should bring certainty to predictions about the effects of future climate on freshwaters, especially in the context of the potential consequences of altitudinal migrations on the spatial variation of community composition and abundance of these small planktonic animals.

Poster session – Friday 21st October 2022, 10:45-11:30h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Hall*)

Effective biomass delignification with deep eutectic solvents

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Efficient valorization of biomass is one of the most important aspects of circular economy. Obtaining valuable products from renewable materials, using ecological methods, is a key factor in natural environment protection. In many cases the first step of biomass valorization is removal of lignin from plant mate-rial. This process can significantly improve further transformations to final products, such as organic acids or monosaccharides. Deep eutectic solvents (DESs) are green chemicals, which have the ability to extract lignin from lignocellulosic material with high efficiency. In this paper we present an efficient method for lignin removal from plant material, using ecological deep eutectic solvents, based on choline chloride. We used waste biomass such as grass, rye straw and walnut shells. The best results were achieved in processes with DESs containing organic acids, such as lactic acid and malonic acid. Also, the impact of temperature of a process was examined – the largest amounts of extracted lignin were gained by delignification at 100°C. The main goal of lignin removal from plant material is enhancing further transformation of biomass, e.g. enzymatic hydrolysis, in order to increase the yield of valuable products. We carried out the enzymatic hydrolysis of pretreated plant material with cellulase from *Aspergillus niger*. The effectiveness of biological transformations was improved, if delignification of biomass was previously performed. This effect was especially visible in case of soft material processing.

Poster session – Friday 21st October 2022, 10:45-11:30h

Clean air, freshwater, healthy soil, and biodiversity

(*Faculty of Education, Hall*)

Evaluation of different environmental covariates performance for modeling soil salinity using Digital Soil Mapping in a susceptible irrigated rural area

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Soil is an indispensable resource for the development of the ecosystems, also working as a support for the human activities, being essential for the agricultural productivity. There are many soil degradation risks that cause a quality deterioration. One of the major risks is soil salinity, caused by the accumulation of salts both naturally and anthropically. For this reason, prevention measures are needed. To this end, soil properties inference and modelling result essential. Thus, the main objective of this research is to find the most useful environmental covariates for modeling soil salinity through the application of the Digital Soil Mapping (DSM) methodology in an irrigated rural area in Castile and Leon (Spain). For this purpose, 132 soil samples from two different laboratories were used, which contained electrical conductivity measured in saturated paste (ECx). In addition, several environmental covariates related to soil salinity were employed to perform a statistical analysis through the combination of multiple linear regression (MLR) and generalized linear models (GLM). Afterwards, the best prediction model and its explanatory covariates were selected. The MLR showed R2 values between 0.382 and 0.581 for the laboratories analyzed. In turn, all the models almost had the same main covariates, which were associated to remote sensing indices and topographic variables. Finally, it was concluded that the method is useful to determine the most important variables for modeling soil salinity, allowing more accurate predictions, identifying which susceptible areas

need preventive measures and helping to achieve those SDGs targets that involve soil's conservation.

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Industry 4.0

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Energy Analysis of a Wastewater Treatment Plant

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The paper focuses on a case-study that deals on biogas capitalization by means of a cogeneration group that employs the biogas coming from treatment plants. The energy, economic and environment effect resulting from the biogas supplying of such a group has been determined quantitatively. An energy and financial determination of the predicted savings as well as the determining of the investment recovery time and the decrease of the impact upon the environment have also been carried out. The obtained results confirm the opportunity of valorizing the biogas from the treatment plants from an energetic, eco-nomic and ecological point of view.

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Rooftop Solar Photovoltaic systems for building of Industrial

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Rooftop Solar Photovoltaic systems may be crucial in the current energy scenario generating electricity on-site where buildings which are used for other purposes and have unused rooftop or other areas, such as, among other things, manufacturing processes, parking lots and residential building because these unused areas may be used to install Photovoltaic system. Moreover, the sizing of this type of systems is easily adjustable due to its modularity and its cost competitiveness when comparing other kinds of power generation sources. Currently, in Spain the potential to cover the electricity demand through Rooftop Solar Photovoltaic system may be between 20-30%. The industrial sector, which has a great unused rooftop and consume large amounts of energy, may play a major role in the energy transition. Electrical parameters of four Rooftop Solar Photovoltaic systems installed in Industrial Cooling and refrigeration industries have been monitored for one year in order to provide the input parameters to estimate the indices. The array power rating varies from 52.8 kW to 400 kW. Load matching metrics based on on-site measurements have been presented using recording intervals of 5 minutes.

High self-consumption indices are achieved, close to 100%, while the self-sufficiency indices vary between 3.75-17.66%. Moreover, the sunshine self-sufficiency index ranges between 6.63 and 30.94%.

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Thermal hydrogen production from petroleum reservoirs using steam reforming and in-situ catalyst application: A technical and economic analysis

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Fluid and solid hydrocarbon reservoirs are one of the most important fossil energy sources in the world. However, due to the high emission of CO_2 and other greenhouse gases, the application of fossil energy is not sustainable. Nevertheless, the infrastructure of the existing oil reservoirs should also be part of the ongoing utilization of the resources; petroleum reservoirs can be used to pro-duce green hydrogen through wet combustion. This technique enables the pro-duction of hydrogen or hydrogen-containing synthesis gas from depleted petroleum reservoirs. This paper gives a brief review of the existing literature, relevant patents, and experiments on the topic. A new type of catalytic hydrogen production from depleting oil reservoir is introduced. Hydrogen production capability and the eco-nomic feasibility are evaluated using data from the literature and the relevant process parameters. Finally, the application limitations of the new process in oil reservoirs are introduced and explained; the physical and chemical parameters which affect the applicability are discussed.

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Monitoring electrical and weather parameters in bifacial System

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Currently, photovoltaic technology (PV) is moving towards technologies that improve the yields for a given resource, such as bifacial modules. The behavior and the measured data are not as widespread as mono-facial technology. Integration of bifacial photovoltaic modules into a building with natural ventilated façade may represent a step forward in the application of this relatively new technology. In this sense, monitoring the crucial parameters in order to analyse module/system performance is becoming crucial. The purpose of this paper is to design a monitoring system for bifacial modules, which can measure, display and store weather (ambient temperature, rear and front irradiances and wind speed) and electrical (current and voltage) parameters. The developed applications allow both; trace the current-voltage curve and track the global maximum power point algorithm.

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The application of nanotechnology in the development of concrete coatings

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In the current scenario, the search for new, more economical and environmentally sustainable approaches that contribute to the circular economy are receiving special attention in all sectors. In the construction sector, the most developed approach is the use of nanotechnology. It is one of the best and most innovative options available to improve performance in this sector. The continuous growth and increasing use of natural resources leads to the search for new materials that are more efficient, sustainable and increase the useful life of materials. In this sense, the use of nanomaterials as surface treatments is one of the fields of research that is evolving the most, since it is possible to prevent deterioration and improve the durability and conservation properties of construction materials, reducing restitution. This article conducts a capillary absorption test, which determines that the graphene oxide used as a protective treatment of the concrete surface decreases capillary water absorption by 15%; this is the beginning of a more exhaustive study to determine the effectiveness of this treatment and to be considered a nano-coating.

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