BOOK OF ABSTRACTS

International Conference on Socio-Environmental Footprints

www.ICSEF.eus

13-14th of June 2024

Faculty of Letters

Paseo de la Universidad, nº5
01006 Vitoria-Gasteiz, Araba
Basque Country

Life Cycle Thinking Group · Universidad del País Vasco · Euskal Herriko Unibertsitatea · medicusmundi · Garapenerako Lankidetzaren Euskal Agentzia · Agencia Vasca de Cooperación para el Desarrollo · Ayuntamiento de Vitoria-Gasteiz · Vitoria-Gasteizko Udala · CEA · ekopol · ihobe

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Non-Governmental Organization for cooperation and development that defends human health as a universal right. Collaborator of local communities to realize this right through an enhancing in health determinants, the environment, gender equality, etc.

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INVITED SPEAKERS

Anne Owen.

- Conference: Lifestages, ages and generaonal Carbon Footprints. GMRIO is showing them.

Jukka Heinonen.

- Conference: The potential of Life Cycle Assessment in the quantification of socio-environmental impacts and future research lines.

Jens Peters.

- Conference: Latest LCA research on sustainable energy storage systems.

Julia Martí Comas and Ana María Palacios, Colectivo Amarantas.

- Conference: How to identify, measure and revert the social impacts of corporates in Global South, feminism perspective.

INTERNATIONAL CONFERENCE ON SOCIO-ENVIRONMENTAL FOOTPRINTS (ICSEF):

ENERGY, MATERIALS, JUSTICE AND WASTE.

PROGRAMME

International Conference on
Socio-Environmental Footprints
www.ICSEF.eus

	13th of June 2024 (Thursday)	14th of June 2024 (Friday)
9:00h	Registration + Documents. Faculty of Letters (Campus Araba UPV/EHU)	
9:30h	Inauguration and Presentation	Inscriptions and registration Faculty of Letters (Campus Araba UPV/EHU)
9:30 - 9:40h	**Medicus Mundi:** Working experiences on cooperation for development and environmental justice.	
9:40 - 9:50h	**Estitxu Villamor:** Welcome. What is a footprint? How embodied impacts in goods and services have overcome the direct emissions in human life's.	
9:50 - 10:00h	**Maider Iturrondobeitia:** Life Cycle Thinking Group (LCTG) and the master of Circular Economy.	
10:00 - 10:30h	Keynote Speakers 1 **Anne Owen:** Living styles, gender, age, does affect to the footprint and GMRIO is showing them. (10 mins questions)	Keynote Speakers 3 **Jens Peters:** Latest LCA research on sustainable energy storage systems. (10 mins questions)
10:30 - 11:00h	Keynote Speakers 2 **Jukka Heinonen:** The potential of Life Cycle Assessment in the quantification of socio-environmental impacts and future research lines.	Keynote Speakers 4 **Julia Martí Comas and Ana María Palacios, Colectivo Amarantas:** How to identify, measure and revert the social impacts of corporates in Global South, feminism perspective. (10 mins questions)
11:00 - 14:00h	MATERIALS FOOTPRINT PANEL. Footprints of different products, companies and services. **Coordination:** Maider Iturriondobeitia **15 Researches 10min+2 min questions.**	ENERGY FOOTPRINT PANEL. Footprints of current whole energy system or certain components/products. **Coordination:** Erlantz Lizundia **15 Researches 10min+2 min questions.**
14:00 - 15:00h	Lunch in the Faculty cafe	Lunch in the Faculty cafe
15:00 - 18:00h	WASTES FOOTPRINT PANEL. International waste measurement, circular economy and optimization. **Coordination:** Gorka Bueno **15 Researches 10min+2 min questions.**	JUSTICE FOOTPRINT PANEL. How global North and Global south are relating facing international footprints responsibility. **Coordination:** Estitxu Villamor **15 Researches 10min+2 min questions.**
18:00 - 18:30h	Instructions for next day	**Best research awards:** Recognition of the Scientific Committee. 100 € best paper of each panel (4): Materials, Energy, Waste and Justice footprints. **Closure**

*Coffee and biscuits available all the time outside the room.

13th June
11:00-14:00

MATERIALS FOOTPRINT PANEL.
Footprints of different products, companies and services.
Coordination: Maider Iturriondobeitia.

10 Researches 14 min+4 min questions.

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1 **11:00-11:18**
Speaker: Gorka Bueno.
Title: Inventory definition for the calculation of the environmental and organisational footprint of the UPV/EHU.

2 **11:18-11:36**
Speaker: María Lozano.
Title: Design and optimization of graphene production processes applying Life Cycle Assessment.

3 **11:36-11:54**
Speaker: Maialen Martinez-Aguirre.
Title: Implementation of a CryoMQL cooling/lubrication technique in the Faculty of Engineering of Vitoria-Gasteiz of the UPV/EHU for a more eco-efficient machining process.

4 **11:54-12:12**
Speaker: Madalen Azpitarte Aretxabaleta.
Title: Fungi as promising source of chitin.

5 **12:12-12:30**
Speaker: Óscar del Hierro Cerezo.
Title: Climate change impact on wheat production in Araba through the IPCC guidelines.

6 **12:30-12:48**
Speaker: Hugo Afonso Gonzalez.
Title: Life Cycle assessment of natural fiber treatments for the development of natural fiber reinforced bio based composites.

7 **12:48-13:06**
Speaker: Jukka Heinonen.
Title: Energy footprints in Iceland.

8 **13:06-13:24**
Speaker: Belén Rey Álvarez.
Title: Human Toxicity emissions of buildings – Critical reflection of building material toxicity and the application of the principle of taxonomy.

9 **13:24-13:42**
Speaker: Antonio García Martínez.
Title: The INDICATE Project: A co-creation approach to obtain benchmark values for whole-life carbon emission of the building sector in Spain.

10 **13:42-14:00**
Speaker: Kevin Joseph Dillman.
Title: Life cycle assessment of passenger and freight transport in the European context.

13th June
15:00-18:00

WASTES FOOTPRINT PANEL.
International waste measurement, circular economy and optimization.
Coordination: Gorka Bueno.

10 Researches 14 min+4 min questions.

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1 **Speaker:** Javier Cesar Muñoz.
15:00-15:18 **Title:** Evaluating the economic sustainability of chitin obtained from fungal resources for a circular biobased economy.

2 **Speaker:** Belén Rey Álvarez.
15:18-15:36 **Title:** Whole-Life Carbon Emissions of Buildings Data Analysis, Supervised Learning.

3 **Speaker:** Naiara Rojo.
15:36-15:54 **Title:** Uncovering Greenhouse Gas Emission Hotspots in Municipal Waste Management for Sustainable Practices in Araba/Álava.

4 **Speaker:** Leire Cantero.
15:54-16:12 **Title:** Comparison of Environmental Impact between Conventional Gluten-Free Breads and Those Enriched with Agro-Food Residues: A Case Study with Apple Pomace From Cider Industry.

5 **Speaker:** María Dolores Bovea.
16:12-16:30 **Title:** Indicators and metrics for evaluating the social performance of municipal waste management systems in mid-/low-income areas.

6 **Speaker:** Karen Valls-Val.
16:30-16:48 **Title:** Application of Sustainable Public Procurement Criteria in Canteen Services in Spanish Universities.

7 **Speaker:** Óscar del Hierro Cerezo.
16:48-17:06 **Title:** Atmospheric carbon dioxide capture and emissions reductions governance Outline and Peri-urban agriculture for Sustainable food system in Vitoria-Gasteiz.

8 **Speaker:** Stiven Lopez Guzman.
17:06-17:24 **Title:** Challenges and opportunities in the direct recycling of new-generation cobalt-free cathode material.

9 **Speaker:** Eduardo Blanco-Espeleta.
17:24-17:42 **Title:** Information for repair decision: consumer implications from environmental and economic perspectives.

10 **Speaker:** Guillermo Rodríguez López.
17:42-18:00 **Title:** Where does employment really occur due to investments in wind energy?

14th June
11:00-14:00

ENERGY FOOTPRINT PANEL.
Footprints of current whole energy system or certain components/products.
Coordination: Erlantz Lizundia.

10 Researches 14 min+4 min questions.

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1 11:00-11:18
Speaker: Markel Arbulu.
Title: Optimisation of passive energy renovation strategies in residential buildings for life cycle global warming potential reduction and cost-effectiveness.

2 11:18-11:36
Speaker: Alex Tro-Cabrera.
Title: Material footprint of rooftop photovoltaics in the city of Vitoria-Gasteiz.

3 11:36-11:54
Speaker: Arkaitz Usubiaga Liaño.
Title: Spanish carbon footprint estimates at NUTS 2 level.

4 11:54-12:12
Speaker: Mireia Martín.
Title: Sustainable Energy Storage: Advancing Sodium Batteries with Biopolymers.

5 12:12-12:30
Speaker: Lierni Rabanete González.
Title: Business Model patterns for Renewable Energy Communities.

6 12:30-12:48
Speaker: Estitxu Villamor.
Title: Energy footprint of Spanish households according to regional and socioeconomic characteristics.

7 12:48-13:06
Speaker: Juan Manuel Campos.
Title: System Dynamics Analysis of Hydrogen Potential and Limitations for Energy Transition.

8 13:06-13:24
Speaker: Jacid Montoya Torres.
Title: Environmental impacts of oil extraction in the Yasuní Reserve of the Amazonian Forest: combined qualitative and Life-Cycle Assessment.

9 13:24-13:42
Speaker: Marta Diez Viera.
Title: Applicability of circular indicators in the assessment of wind turbine blade end-of-life management alternatives.

10 13:42-14:00
Speaker: Felipe Díaz Alvarado.
Title: Regenerative Design in Photovoltaic Solar Systems: The Canela Solar Park Project.

14th June
15:00-18:00

JUSTICE FOOTPRINT PANEL.
How global North and Global south are relating facing international footprints responsibility.
Coordination: Estitxu Villamor.

8 Researches 14 min+4 min questions.

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1 **Speaker:** Gemma Morell.
15:00-15:18 **Title:** The journey of a discarded t-shirt: from the Global North to the Atacama illegal landfill.

2 **Speaker:** María Victoria Román.
15:18-15:36 **Title:** Measuring footprints of agri-food consumption with Agro-SCAN, a new Multi-Regional Input-Output database.

3 **Speaker:** Luz Marina Ruiz Hernández.
15:36-15:54 **Title:** Integration of Life Cycle Assessment (LCA) knowledge in the Environmental Sciences Degree: Analysing the andalusian universities.

4 **Speaker:** Jonathan Michel Barba Godinez.
15:54-16:12 **Title:** Biodegradability assessment of new biodegradable and compostable batteries: understanding the end-of-life scenarios.

5 **Speaker:** Julia Sborz.
16:12-16:30 **Title:** What does low-carbon living look like in Europe in various types of built environments?

6 **Speaker:** Iñaki Sasia.
16:30-16:48 **Title:** Amalur EIS: A system for calculating the environmental footprints of industrial sites from E-PRTR records.

7 **Speaker:** Eneko Garmendia.
16:48-17:06 **Title:** Improving the social impact of Higher Education Institutions: Combining SO-LCA and Multi-Criteria Evaluation.

8 **Speaker:** Mohammed Salem.
17:06-17:24 **Title:** Exploring the Impact of Economic Incentives on Food Waste Reduction: The Moderating Role of Financial Constraints.

9 **Speaker:** Marina Isasa.
17:24-17:42 **Title:** Exploring the Impact of Economic Incentives on Food Waste Reduction: The A multi-criteria evaluation of shifting to local production in the textile sector: ORIENTING LCSA methodology application

MATERIALS

13th of June 2024, 11:00h - 14:00h

Coordination: Maider Iturriondobeitia

Life Cycle Thinking Group · Universidad del País Vasco · Euskal Herriko Unibertsitatea · medicusmundi · Garapenerako Lankidetzaren Euskal Agentzia · Agencia Vasca de Cooperación para el Desarrollo · Ayuntamiento de Vitoria-Gasteiz · Vitoria-Gasteizko Udala · CEA · ekopol · ihobe · ingurumen hobekuntza · mejora ambiental

13th of June, 11:00h

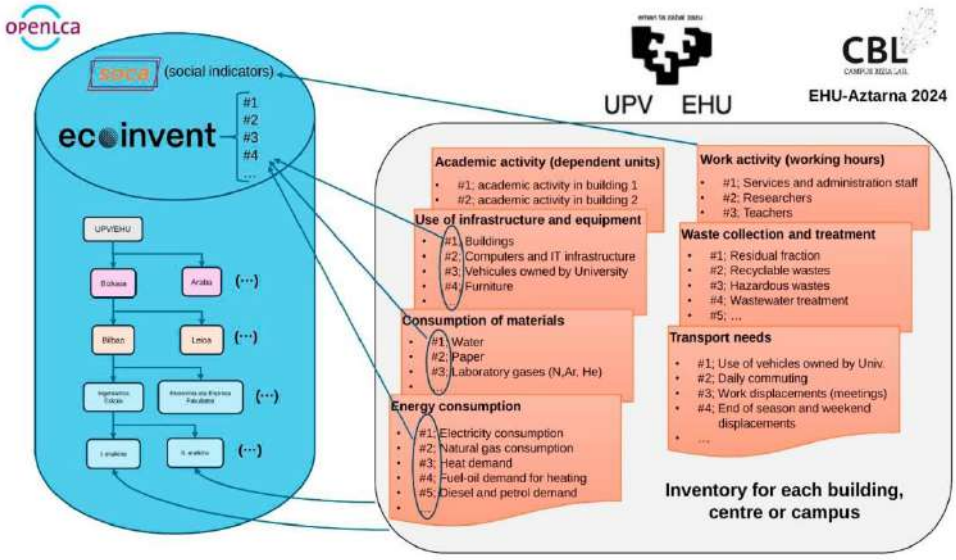
Inventory definition for the calculation of the environmental and organisational footprint of the UPV/EHU.

Gorka Bueno, Estibaliz Pérez, Maite de Blas, Iñaki Zuazo, Eduardo de la Torre, Artitzar Erauskin, Iker Etxano, Itziar Barinaga-Rementeria, Unai Tamayo, Eneko Garmendia, Isaac Barrio, Gaizka Zulueta.

University of the Basque Country UPV/EHU.

Email: gorka.bueno@ehu.eus

For more than a decade, the European Commission has been promoting the use of the Organisational Environmental Footprint (OEF) as a privileged method for measuring the environmental performance of organisations. Higher Education Institutions (HEI) have a serious responsibility to lead the implementation of this tool, both for their exemplary behaviour and social leadership as well as for their training and knowledge generation work. The EHU-Aztarna project, within the framework of various university initiatives under the umbrella of the 2030 Agenda, aims to calculate the UPV/EHU's environmental and organisational footprint in 2024, aligned with the proposals of the European Commission and the UNEP/SETAC Life Cycle Initiative. This communication presents the results of the first phase of the project, which defines the life cycle inventory of the UPV/EHU's academic activity. This inventory is implemented in a database in openLCA format using a hierarchical structure
adapted to the complex territorial architecture of the UPV/EHU. The inventory feeds a process-based LCA analysis and is supported by the ecoinvent v3.7 with the soca v2 add-on module. This inventory structure will make it possible to analyse environmental and social impacts broken down according to the locations of buildings and centres, and also according to the different components of academic activity (consumption of energy and materials, use of infrastructure, waste collection and treatment, transport needs, work activity). This work represents an improvement on the previous calculation made for the year 2016 and can be of great help to other organisations, e.g. HEIs, wishing to undertake the calculation of their OEF and OSF.



13th of June, 11:18h

Design and optimization of graphene production processes applying Life Cycle Assessment.

Maria-Lozano[1], Lorena Ugarte[2], Maider Iturrondobeitia[3].

[1] University of the Basque Country (UPV/EHU), Department of Graphical Design and Project Engineering Donostia-San Sebastian, Spain; [2] University of the Basque Country (UPV/EHU), Department of Graphical Design and Project EngineeringEibar, Spain; [3]University of the Basque Country (UPV/EHU), Department of Graphical Design and Project Engineering, Bilbao, Spain.

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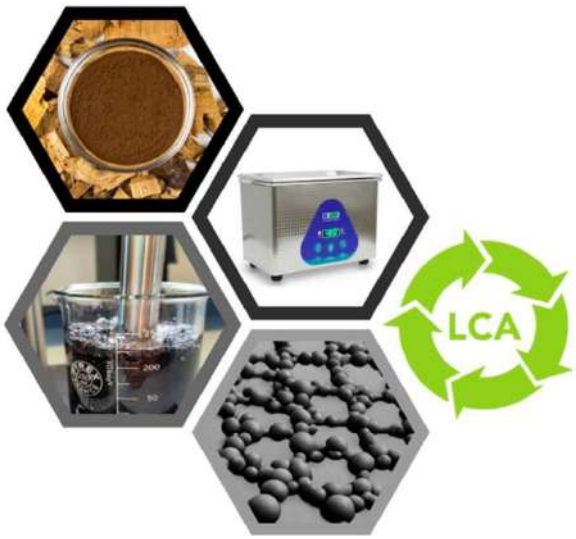
Graphene is a material with high potential in the development of advanced materials. Technological progress should align with sustainability, making it essential to explore efficient and sustainable alternatives for graphene exfoliation in a liquid-phase. In this study, chestnut tannins were employed as surfactants for graphene exfoliation in an aqueous media, utilizing both ultrasound and high-shear exfoliation methods. The impact of the initial graphene concentration, initial tannin concentration and exfoliation time on the concentration of the obtained graphene suspensions and mass yield was assessed.

The results demonstrated values comparable to solvent-based exfoliation, such as N-Methyl-Pyrrolidone (NMP), were achieved. Morphological characterization of the obtained graphene flakes was obtained using Raman spectroscopy and Transmission Electron Microscopy (TEM). The findings indicated that high-shear exfoliation resulted in graphene flakes with the highest ID/IG ratio and a more homogeneous thickness. Life Cycle Assessment of the exfoliation processes revealed the environmental advantages of water-based exfoliation processes compared to traditional solvent-based NMP processes. High-shear exfoliation with an initial graphene concentration of 5 mg·mL-1, a tannin concentration of 1 mg·mL-1, and a shearing time of 15 minutes emerged as the most balanced option between quality and sustainability, according to the applied Life Cycle Assessment.



13th of June, 11:36h

Implementation of a CryoMQL cooling/lubrication technique in the Faculty of Engineering of Vitoria-Gasteiz of the UPV/EHU for a more eco-efficient machining process.

M. Martinez-Aguirre[1], O. Pereira[1], A. Rodríguez[1], G. Gómez[1], A. Calleja-Ochoa[1], Erlantz Lizundia[2].

[1] High Performance Manufacturing Group, Department of Mechanical Engineering, the University of the Basque Country, Bilbao, Basque Country, Spain; [2]Department of Graphic Design and Engineering Projects, Faculty of Engineering in Bilbao, University of the Basque Country, Bilbao, Basque Country, Spain

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The pursuit of more eco-efficient manufacturing processes represents a revolution in recent years, driven by the need to reduce the environmental footprint. In the machining sector, the control of cooling and lubrication techniques directly affects the environmental impact. Therefore, new techniques are aimed at making goods more eco-friendly from the beginning of their life cycle to the end of their useful life.

For this reason, in this paper, the implementation of a cooling/lubricating technique for machining processes at the Faculty of Engineering of Vitoria-Gasteiz of the University of the Basque Country (UPV/EHU) in Vitoria-Gasteiz is proposed, which combines cryogenic and Minimal Quantity Lubrication (MQL). This technique is not only environmentally efficient, but it also reduces machining costs. Consequently, CryoMQL is considered a real alternative to machining with oil emulsions of mineral or synthetic origin, which is the lubrication method most commonly used.

To this end, a comparison between both cooling/lubrication techniques is conducted, by performing a life cycle analysis of these lubrication techniques from an environmental point of view. The results obtained demonstrate that in order to achieve eco-friendly objectives, it is essential to reduce or even eliminate cutting fluids from the manufacturing processes and that the implementation of CryoMQL is the key factor in achieving success.

13th of June, 11:54h

Fungi as promising source of chitin.

Madalen Azpitarte Aretxabaleta[1], Gotzone Barandika Argoitia[2], Erlantz Lizundia Fernandez[3].

[1]Faculty of Science and Technology, University of the Basque Country (UPV/EHU), Bilbao, Spain; [2]Life Cycle Thinking Group, Department of Organic and Inorganic Chemistry, Faculty of Science and Technology, University of the Basque Country (UPV/EHU), BCMaterials, Basque Center for Materials, Applications and Nanostructures, UPV/EHU Science Park, Leioa 48940,Bilbao, Spain; [3]Life Cycle Thinking Group, Department of Graphic Design and Engineering Projects, Faculty of Engineering in Bilbao, University of the Basque Country (UPV/EHU),BCMaterials, Basque Center for Materials, Applications and Nanostructures, UPV/EHU Science Park, Leioa, Spain.

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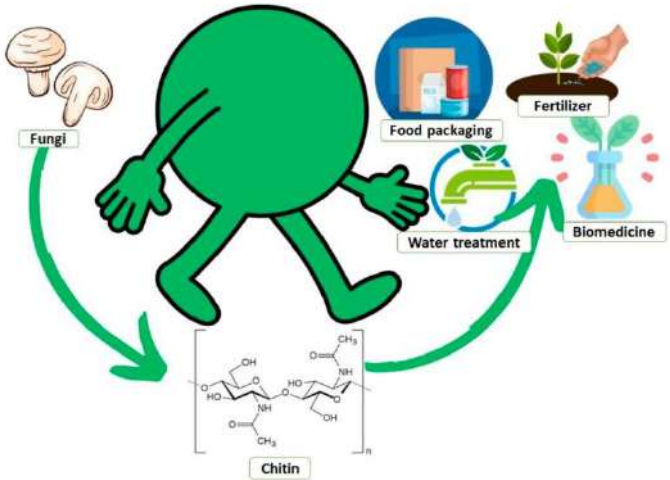
Food waste valorization can reintroduce useful materials back in circular economy, steering us towards a sustainable world. Within the functional materials that are obtained from the valorization of food waste, chitin is a potential and promising biopolymer. Chitin is the most abundant polysaccharide, after cellulose, and it presents properties which include rigidity or thermal stability. Into the bargain, it also presents environmentally friendly properties such as nontoxicity, biodegradability and biocompatibility. Those properties are attached to the chemical structure where hydrogen bonding promote a crystalline microfibril structure. The orientation of the microfibrils gives three crystalline allomorphs: α-chitin, β-chitin and γ-chitin. Due to the interesting properties attached to chitin, it is widely used in various applications, for instance, biomedicine, food packaging, agriculture or water treatment. The source of extraction of chitin can vary from marine products to fungi. Among them, fungi are a promising extraction source, due to several advantages that present in comparison with marine products, concerning that marine products are subjected to seasonal supply. However, the extraction mechanism of chitin from fungi should involve green chemistry-based extraction methods, with the aim of contributing to the circular economy. Herein, we will explore the potentials of chitin, highlighting the advantages of fungi as an extraction source.



13th of June, 12:12h

Climate change impact on wheat production in Araba through the IPCC guidelines.

Óscar del Hierro, Patricia Gallejones, Sorkunde Mendarte, Olatz Unamunzaga, Haritz Arriaga, Eduardo Rosa, Pilar Merino.

NEIKER, Conservation of Natural Resources (CRN), Derio, Spain.

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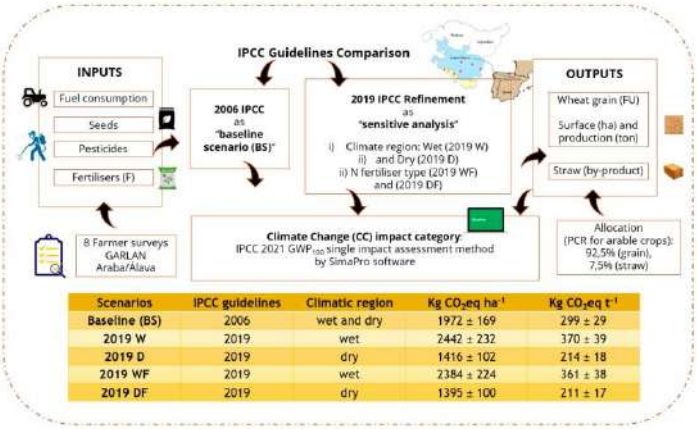
This study aimed to estimate the environmental impact of winter wheat production in the province of Araba, Northen Spain, using cradle-to-farm-gate life cycle assessment (LCA) methodology, as well as to assess how methodological choices can influence such estimation (IPCC 2006 Guidelines vs. IPCC 2019 Refinement). The IPCC 2006 guidelines was established as the Baseline scenario (BS) and the IPCC 2019 refinement guideline as the sensitive analysis, wherein the emission factors were disaggregated by climate type, wet or dry, and by type of N-fertiliser applied to soil. The impact assessment method selected for evaluation of the environmental impact (climate change impact category, CC) was the single IPCC 2021 GWP100 through the software SimaPro v9.5.0.0. Breaking down the CC impact contribution in wheat production, the production of mineral fertiliser and the direct emission of N2O resulting from the N mineral fertilization were identified as the two main contributors to the environmental impact of wheat production in the region (68%). The remaining percent of the carbon impacts were indirect N2O emissions, direct energy (fuel consumption during the agricultural field operations), and manufacture of seed and pesticides. The CC impact was 299 kg CO2eq t-1 and 1972 kg CO2eq ha-1 in wheat produced on average for the BS. The application of the IPCC 2019 refinement increased the estimation of CC, in terms of kg CO2eq t-1, by a factor of 1.24 and decreased by a factor of 0.72 considering the province of Araba as wet (2019 W) or dry region (2019 D), respectively. When the type of N-fertiliser is considered, the factor is 1.10 and 0.71, respectively. Our results emphasise the importance of the choice of methodology, adapted to the specific case under study, when estimating the environmental impact of food production systems at regional level, and can help policy makers establish mitigation options for the processes that affect the environmental sustainability of wheat production in regions like Spain, affecting the prioritization of the mitigation options.



Scenarios	IPCC guidelines	Climatic region	Kg CO_2eq ha^{-1}	Kg CO_2eq t^{-1}
Baseline (BS)	2006	wet and dry	1972 ± 169	299 ± 29
2019 W	2019	wet	2442 ± 232	370 ± 39
2019 D	2019	dry	1416 ± 102	214 ± 18
2019 WF	2019	wet	2384 ± 224	361 ± 38
2019 DF	2019	dry	1395 ± 100	211 ± 17

13th of June, 12:30h

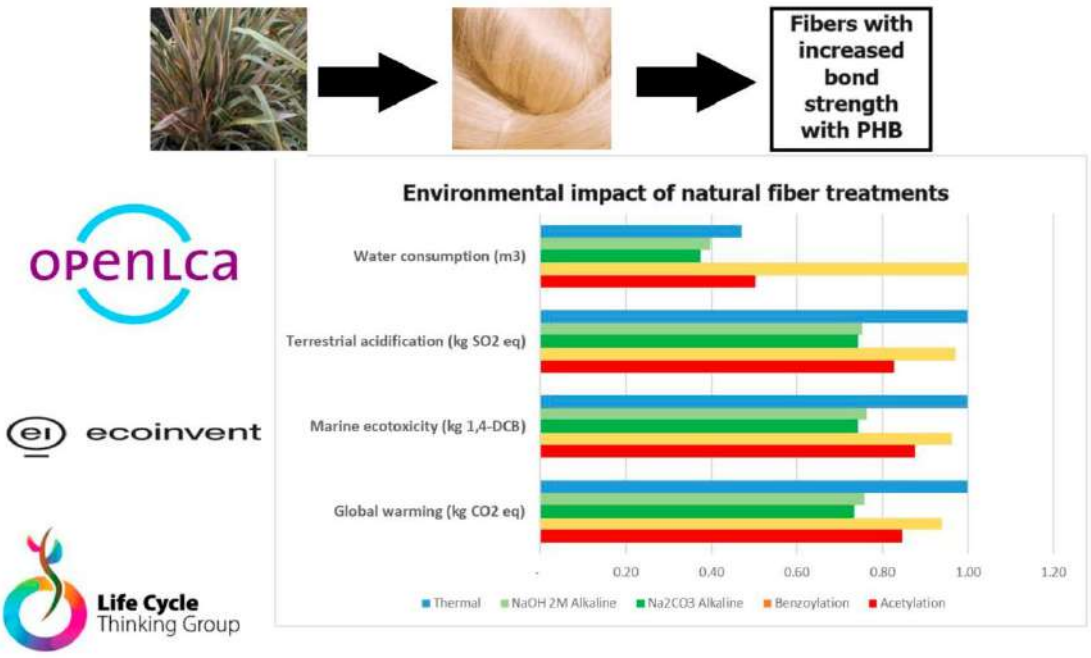
Life Cycle assessment of natural fiber treatments for the development of natural fiber reinforced bio based composites.

Hugo Afonso González, Julen Ibarretxe Uriguen, Maider Iturrondobeitia Ellacuria.

University of the Basque Country, Life Cycle Thinking Group, Graphical Expression and Engineering Projects Department, Bilbao, Spain.

Email: hugo.afonso@ehu.eus

Plastic pollution and resource scarcity demand sustainable alternatives to conventional polymers. Biodegradable and bio-based options like Polylactic Acid (PLA) and Polyhydroxybutyrate (PHB) offer promising properties but often fall short for engineering use. Reinforcing polymers with fibers like glass or carbon improves performance, but these materials lack the sustainability appeal of natural alternatives. Therefore, natural fiber (NF) such as sisal, when properly treated (e.g., surface coatings, thermal treatments, chemical mercerization), hold potential for manufacturing fully renewable and high-performance, NF reinforced composites (NFRC). This study employs Life Cycle Assessment (LCA) to compare the environmental impacts of various fiber treatments used to make sisal fibers compatible with a PHB matrix. The aim is identifying the most environmentally friendly treatment for sisal fibers to be compatible with PHB, achieving a favourable mechanical properties-environmental impact balance. The LCA also evaluates alternative NFs environmental impact due to the transport from their countries of origin and consider the improvements achieved using renewable energy sources during the treatment. The conducted LCA points towards Na2CO3 fiber surface treatments being a promising option to improve NF-PHB compatibility. Additionally, selecting sustainable fiber treatment options seems to outweigh the impacts associated with transportation when dealing with imported fibers.



13th of June, 12:48h

Energy footprints in Iceland.

Jukka Heinonen[1], Anna Kristín Einarsdóttir[1], Kevin Joseph Dillman[2].

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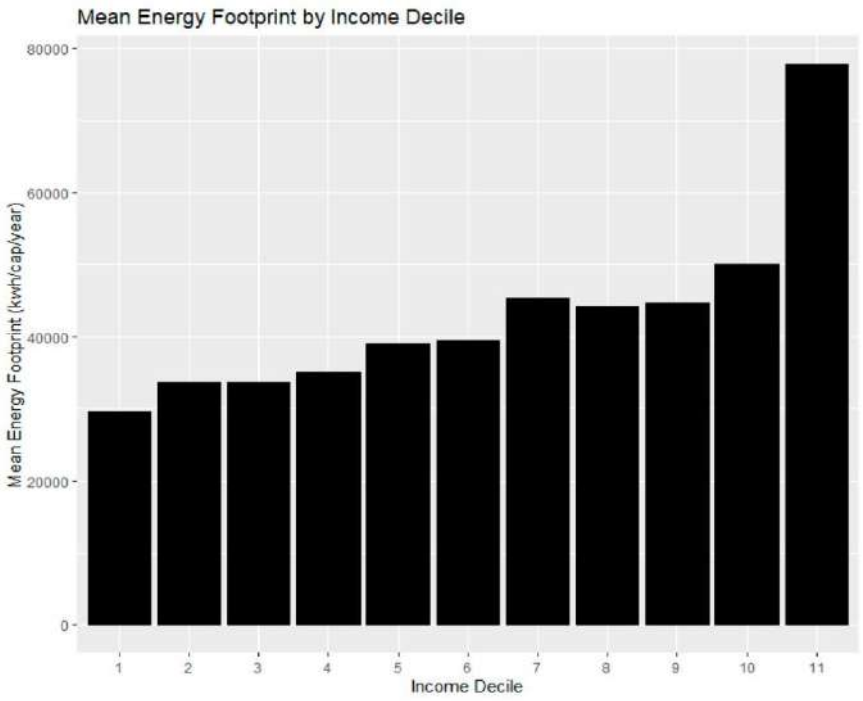
Amid the urgent global imperative to cap warming at 2°C, and as one important enabling element to mitigate global energy demand, studying the demand-side and the connection between lifestyles and globally induced energy needs is of high importance. This study adds to the limited literature on bottom-up analyses of how lifestyles are connected to global energy demand. By focusing on Iceland as a case study, a frontrunner country in renewable energy production, but also a highly affluent society, we also add a new type of an example to the existing literature. We find high energy footprints both across the income range and across space. The key domains are housing and transportation, which are influenced by factors such as income levels, level of urbanization, and individual lifestyle choices.

With detailed data from a survey with 1,500 respondents, this study offers critical insights essential for formulating sustainable energy policies that not only emphasize technological progress but also prioritize the imperative of reducing energy demand and fostering a transition toward energy sufficiency. This comprehensive analysis not only paves the way for future research endeavours to delve deeper into the intersections of energy consumption, socio-economic dynamics, and societal well-being but also furnishes a nuanced comprehension indispensable for crafting effective sufficiency-oriented, demand-side policies conducive to forging a sustainable energy future.



13th of June, 13:06h

Human Toxicity emissions of buildings – Critical reflection of building material toxicity and the application of the principle of taxonomy.

Belén Rey Álvarez[1], Benito Sánchez-Montañés Macías[1], Antonio García-Martínez[2].

[1]*HUM-1008 Research Group, E.T.S Arquitectura, Universidad de Sevilla, Spain;* [2]*TEP-130 Research Group, Instituto Universitario de Arquitectura y Ciencias de la Construcción, Universidad de Sevilla, Spain.*

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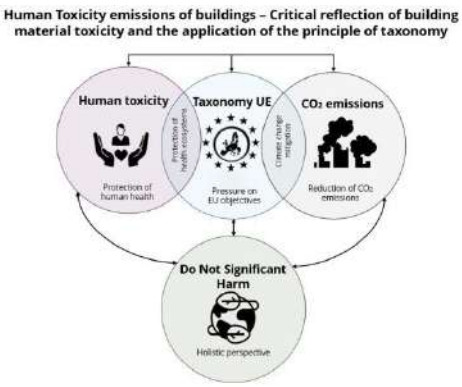
The construction sector is a vital component of the global economy, but its environmental footprint, particularly in terms of carbon dioxide (CO2) emissions, has raised significant concerns. While efforts have focused primarily on mitigating CO2 emissions, other critical factors such as the toxicity of building materials have often been overlooked. Consequently, there is an urgent need to adopt a holistic approach that encompasses all aspects of environmental assessment, including toxicity, through tools such as Life Cycle Assessment (LCA).

Using methodologies such as LCA allows a comprehensive evaluation of the environmental impacts of building, materials and processes throughout their entire life cycle. Standardisation of LCA methodologies, including relevant standards such as ISO 14040/14044 and EN 15804, ensures a systematic approach to environmental performance assessments in the construction sector.

A critical review of the current literature reveals a significant gap in the addressing of human toxicity in LCA analyses, with a predominant focus on zero-energy buildings overlooked by broader ecological considerations. Although CO2 emissions and embodied energy are commonly compared, toxicity assessments are often overlooked despite their equal importance.

European policies, such as the EU Taxonomy Regulation and the Do Not Significant Harm (DNSH) principle, are steps toward holistic environmental assessments, yet they fall short by not mandating the consideration of human toxicity in environmental impact assessments. A broader perspective is essential to ensure that environmental policies address all dimensions of impact, including human health.

Moving forward, it is imperative to integrate toxicity as a mandatory factor in environmental impact assessments, alongside efforts to standardise databases, improve LCA calibrations, and incorporate data on the phase of use of building materials. By adopting a comprehensive approach that considers all dimensions of environmental impact, we can pave the way for a more sustainable future in the construction sector and beyond.



13th of June, 13:24h

The INDICATE Project: A co-creation approach to obtain benchmark values for whole-life carbon emission of the building sector in Spain.

Antonio García-Martinez[1], Belén Rey-Álvarez[2], Bernardette Soust-Verdaguer[3], Beatriz de Diego[4], Alicia de la Fuente[4]

[1]TEP-130 Research group, Insituto Universitario de Arquitectura y Ciencias de la Construcción Universidad de Sevilla, Spain; [2]HUM-1008 Research group, E.T.S Arquitectura, Universidad de Sevilla, Spain; [3]TEP-986 Research group, E.T.S Arquitectura, Universidad de Sevilla, Spain; [4]Green Building Council, GBCe.

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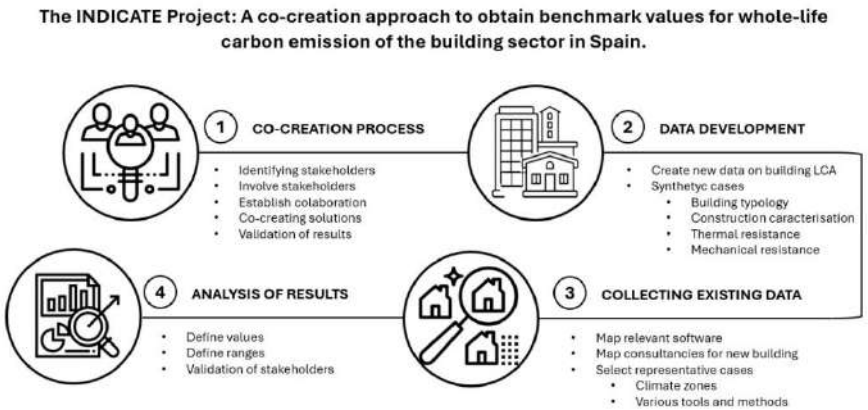
Currently, there is an urgent need to implement measures to reduce carbon emissions throughout the whole life cycle of buildings in Mediterranean regions. In the Spanish context, despite various initiatives, there is no harmonised life cycle assessment (LCA) method or a national database of construction products with associated environmental data. Due to the limited comparability, accessibility and transparency of existing building LCA data, policymakers lack a solid foundation for action. This article presents a summary of the methodology, preliminary results, and lessons learnt from the INDICATE project in Spain, whose focus is to accelerate the data infrastructure to implement Whole Life Carbon (WLC) metrics in the construction sector in Spain. The goal is to provide scientific and technical support to develop data for the national building stock harmonised with the level(s) framework and create a robust national infrastructure to assess theWLC, including reference values, baselines, and benchmarks. This will contribute to the integration of WLC into policymaker decisions, existing regulations, and market innovation, involving key stakeholders from representative regions in Spain and creating a stakeholder network. This study uses a co-creation approach to define, among other things, methodological options for LCA, building typologies, and material characteristics included in the study. It compares actual LCA results provided by collaborators (LCA consultants, etc.) with results from synthetic archetype LCA (using a BIM workflow) and results from real building LCAs developed following a co-created LCA method. An overview of the most relevant findings of this study is provided.



13th of June, 13:42h

Life cycle assessment of passenger and freight transport in the European context.

Kevin Joseph Dillman[1], Jacid Montoya Torres[2].

[1]Environment and Natural Resources, School of Engineering and Natural Sciences, University of Iceland, Reykjavík, Iceland; [2]Life-Cycle Thinking Group, Department of Graphic Design and Engineering Projects. University of the Basque Country (UPV/EHU), Bilbao, Biscay, Spain, Escuela Superior de Empresa, Ingeniería y Tecnología, Bogotá, Colombia.

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This paper conducts a detailed Life Cycle Assessment (LCA) of seven distinct vehicle types, encompassing options such as buses, regular passenger vehicles, and heavy-duty transport solutions, to evaluate environmentally sustainable alternatives to traditional fuels and transit options. The assessment includes a variety of propulsion technologies, such as electric, natural gas, petrol, and diesel options in a Spanish context. By examining the environmental impacts across 18 distinct categories, the study offers insights into the potential environmental benefits and drawbacks associated with each vehicle type. The findings serve as a valuable resource for understanding the broader ecological implications of transportation technologies in the context of advancing towards more sustainable transport solutions.

WASTE

13th of June 2024, 15:00h - 18:00h

Coordination: Gorka bueno

Life Cycle Thinking Group

Universidad del País Vasco Euskal Herriko Unibertsitatea

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Agencia Vasca de Cooperación para el Desarrollo

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13th of June, 15:00h

Evaluating the economic sustainability of chitin obtained from fungal resources for a circular biobased economy.

Javier Cesar Muñoz[1], Vanessa Grifoll[2], Margarita Pérez-Clavijo[2], María Saiz-Santos[3], Erlantz Lizundia[1, 4]

[1]*Life Cycle Thinking Group, Department of Graphic Design and Engineering Projects, University of the Basque Country (UPV/EHU), Bilbao, Biscay, Spain;* [2]*Mushroom Technological Research Centre of La Rioja (CTICH), Autol (La Rioja), Spain;* [3]*ECISE Group: Circular Economy, Innovation, Sustainability and Entrepreneurship, Faculty of Economy and Business Administration, University of the Basque Country (UPV/EHU), Bilbao, Biscay, Spain;* [4]*BCMaterials, Basque Centre for Materials, Applications and Nanostructures, Edif. Martina Casiano, Leioa, Biscay, Spain.*

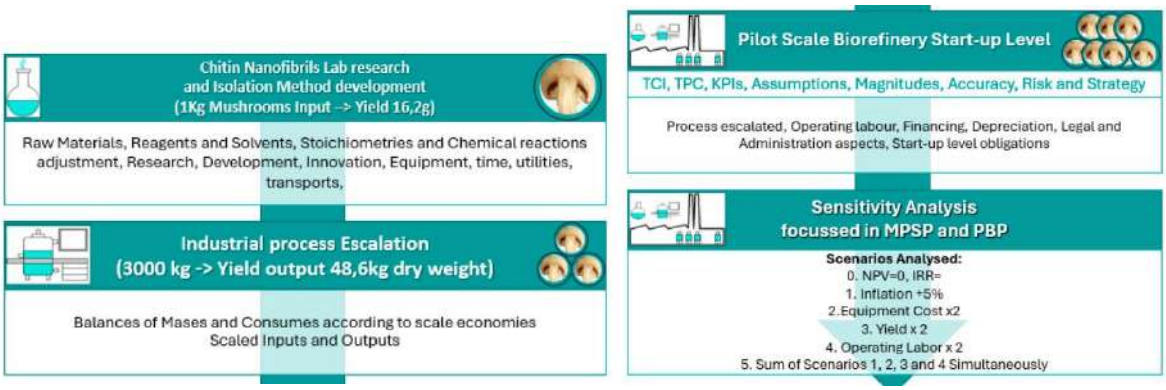
Email: jcmunoz001@ikasle.ehu.eus

In the context of industrial business development, there are many ways to create value-added products and fostering a circular bioeconomy. One is creating biodegradable and biobased products. The main goal of this techno-economic assessment (TEA) is to contribute to developing a new material that complies with worldwide demands regarding climate change and its obvious environmental impacts.

The lab-tested fungal chitin nanofibrils (ChNF) isolation method is escalated to a pilot biorefinery to achieve a transformation of 3 tons.day-1, yielding a production of 48.6 kg of discarded mushroom and day, valorizing non-marketable products as the main raw material. The promising results have given a price of ~212 € kg-1, with an initial investment of ~1.1M€ and a payback period of ~11years.

Previous life cycle assessments are enhancing its development against other competitors, like cellulose or crustacean sources, due to the lack of acid usage, notably reducing its CO2 footprint. Although their yield values are higher, 25 wt% and 9.7 wt% respectively, they have similar or higher average market prices (245 € kg-1,777 € kg-1 respectively).

This facility represents a future opportunity in terms of new market development, such as biomedical, packaging, batteries, or vegan food, and for the development of similar-property compounds.



13th of June, 15:18h

Whole-Life Carbon Emissions of Buildings Data Analysis, Supervised Learning.

Darya Gachkar[1], Belén Rey-Álvarez[2], Sadaf Gachkar[1], Antonio Garcia-Martinez[3], Bernardette Soust-Veredaguer[4], Nuria Gómez-Vargas[5].

[1]Universidad de Sevilla, Escuela Técnica Superior de Arquitectura, Sevilla, Spain; [2]HUM – 1008 Research Group, E.T.S. Arquitectura, Universidad de Sevilla, Spain; [3]TEP 130 Research Group. Instituto Universitario de Arquitectura y Ciencias de la Construcción IUACC, Universidad de Sevilla; [4]TEP- 986 Research Group, E.T.S. Arquitectura, Universidad de Sevilla, Spain; [5]Department of Statistics and Operations Research, Faculty of Mathematics, University of Seville, Spain

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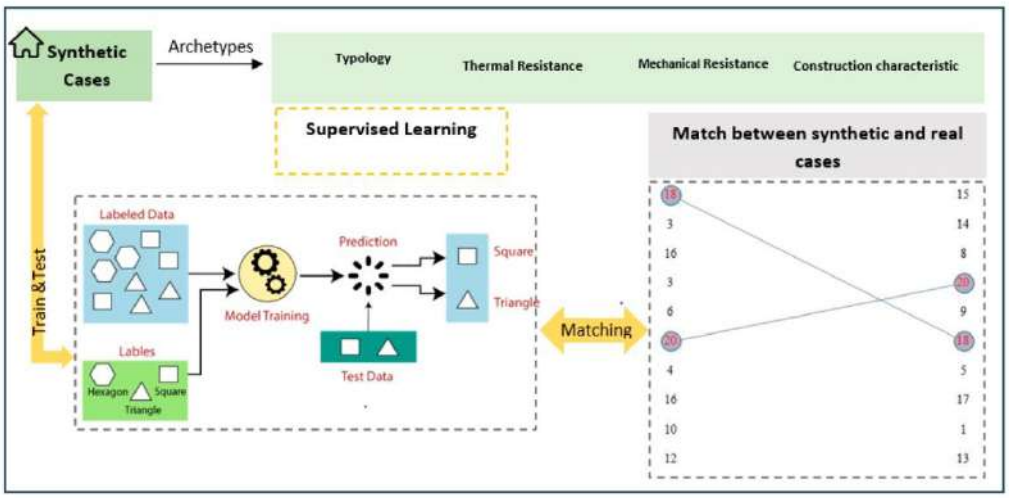
Life Cycle Assessment (LCA) is crucial for evaluating the environmental impacts of buildings, yet real-world applications face challenges due to data scarcity. This study presents a novel methodology developed in the framework of the INDICATE Spain project, to overcome the data limitations in understanding the environmental impact of real buildings. With a focus on Whole-Life Carbon Emissions Data of buildings developed using life cycle assessment methodology, we leverage synthetic building archetypes LCA data, real LCA collected data, and machine learning techniques to bridge the knowledge gap. The dataset comprises synthetic and real building cases, each characterized by a unique code and a comprehensive set of attributes. Our approach involves training a program and using of Supervised Learning on synthetic data, enabling it to predict the building codes for real cases. The predictions are then mapped to actual building names, providing a tangible connection between synthetic and real scenarios. Implemented in Python, this methodology offers a promising avenue for enhancing the precision of life cycle assessments and holds significant implications for sustainable urban development.



13th of June, 15:36h

Uncovering Greenhouse Gas Emission Hotspots in Municipal Waste Management for Sustainable Practices in Araba/Álava.

Naiara Rojo[1], Daniel Zuazagoitia[2], Alba Muñoz[3], Arkaitz Gobantes[3], Iker Alejo[4].

[1]University of the Basque Country UPV/EHU, Faculty of Engineering of Vitoria-Gasteiz, Department of Chemical and Environmental Engineering, Vitoria-Gasteiz, Spain; [2]University of the Basque Country UPV/EHU, Faculty of Education and Sport, Department of Matemathics, Experimental and Social Sciences Educatio, Vitoria-Gasteiz, Spain; [3]Kromletx, Araia, Spain; [4]UTE OBSARAB, Vitoria-Gasteiz, Spain.

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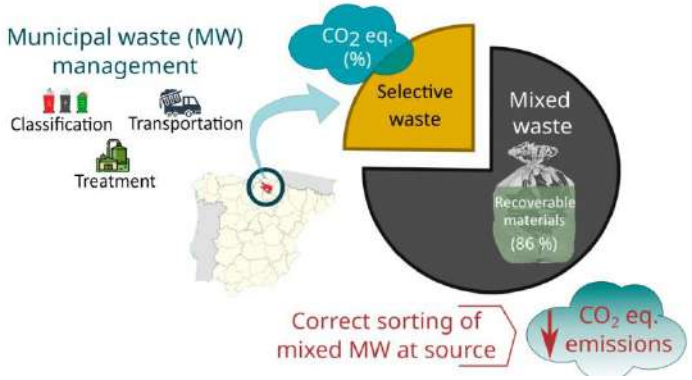
The generation and management of municipal waste (MW) have become critical global issues in recent decades, given their social, economic, and environmental implications. European Directives have ushered in measures aimed at curbing waste generation and enhancing waste management practices. At the local level, in Araba/Álava (Basque Country), the guiding principles derived from these regulations have been incorporated into the Urban Waste Prevention and Management Plan of Araba/Álava (2017-2030), implemented by the Provincial Council of Álava.

This research aims to quantify greenhouse gas (GHG) emissions, measured in CO2 equivalent, associ-ated with the transport, sorting and treatment of MW in Araba/Álava. Given that 61% of the region's MW is collected mixed or unsorted, efforts were made to characterize this fraction to propose manage-ment alternatives conducive to reducing GHG emissions.

Key findings revealed that in 2022, sorting and transportation of MW contributed to less than 8% of the CO2 eq., and treatment processes were the primary contributors to GHG emissions. Notably, mixed MW, primarily destined for landfills, accounted for 75% of emissions. The characterization of this unsorted waste fraction highlighted bio-waste as a critical area for targeted action to achieve significant reductions in GHG emissions.

This work has been carried out by the research team attached to the Municipal Waste Observatory of Álava, dependent on the Provincial Council of Álava. The findings contribute valuable insights into the GHG emissions landscape of MW management in Araba/Álava, offering a basis for informed policy formulation and sustainable waste management strategies.



13th of June, 15:54h

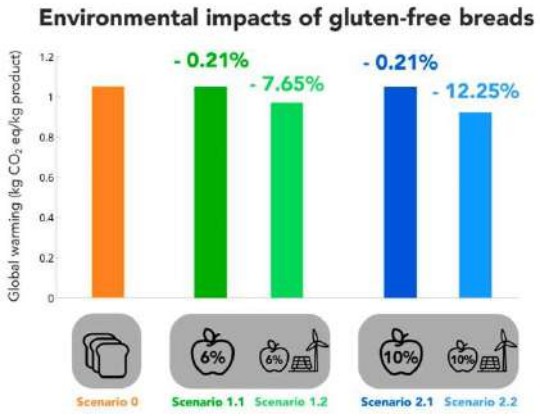
Comparison of Environmental Impact between Conventional Gluten-Free Breads and Those Enriched with Agro-Food Residues: A Case Study with Apple Pomace From Cider Industry.

Leire Cantero-Ruiz de Eguino[1], Estitxu Villamor[2], Olaia Martínez1,[3,4], Ortzi Akizu-Gardoki[5], Silvia Matías[1], Maite Perez-Azurmendi[1],

[1]GLUTEN3S Research Group, Department of Nutrition and Food Science, University of the Basque Country (UPV/EHU), Vitoria-Gasteiz, Spain; [2]EKOPOL Research Group, Department of Physics (UPV/EHU), Vitoria-Gasteiz, Spain; [3]Gluten Analysis Laboratory, Department of Nutrition and Food Science (UPV/EHU), Vitoria-Gasteiz, Spain; [4]Bioaraba Health Research Institute, Nutrition and Food Safety Research Group, Vitoria-Gasteiz, Spain; [5]Life Cycle Thinking Group, Department of of Graphic Design and Engineering Projects (UPV/EHU), Bilbao, Spain.

Email: leire.canteror@ehu.eus

This project focuses on valorising a by-product from the fruit and vegetable industry for its incorporation into gluten-free bread production. Utilizing agro-food waste enables more sustainable practices, although many related studies often involve extracting specific compounds instead of using the whole waste, thereby generating waste and additional impacts, too. Gluten-free bread typically lacks the nutritional and sensory qualities of its gluten-containing counterpart. Thus, we propose processing apple pomace, a by-product of cider production that contains antioxidant compounds, micronutrients and high fiber content, into an added-value ingredient for gluten-free bread formulations, potentially enhancing its characteristics.
To assess the environmental impact of both the waste processing and the bread, a quantitative study with OpenLCA software was conducted, along with the databases Ecoinvent and Agribalyse, as well as experimental data.
In this study, all the apple pomace waste is reused (not only an extracted part). However, its treatment involves a highly consuming dehydration stage, which could be mitigated up to a 94.92% by using renewable energies. Although incorporating the by-product into the bread formulation shows a reduction in environmental impact, future efforts should prioritize minimizing the impact of the waste treatment, as increasing apple pomace content in bread may inadvertently heighten overall process impacts due to dehydration stage conditions.



13th of June, 16:12h

Indicators and metrics for evaluating the social performance of municipal waste management systems in mid-/low-income areas.

María D. Bovea Edo[1], Hendrigo Venes[2], Valeria Ibáñez-Forés[1], Renato Ribeiro Siman[2]

[1]*Universitat Jaume I, Department of Mechanical Engineering and Construction, Castelló de la Plana, Spain;*
[2]*Universidade Federal do Espírito Santo, Department of Environmental Engineering, Vitória, Brazil.*

Email: bovea@uji.es

Currently, the recyclable waste of more than 15 million people around the world is treated by the informal waste management sector, based on the informal work of waste pickers. These individuals often belong to vulnerable social groups — such as poor women, children, the elderly, the unemployed or immigrants — have no social safety, and are subjected to the economic instability of the recyclable waste sector. Although there is consensus and international standards to apply methods and metrics to quantify the environmental performance of systems, the quantification of their social performance still requires methodological advances. Therefore, this study proposes a set of social indicators and metrics — based on UNEP/SETAC categories, a literature review, and consideration of the Sustainable Development Goals — for the various stakeholders involved in the life cycle of a municipal solid waste management system for developing countries. For this purpose, a systematic literature review was conducted to identify the social categories/indicators used in previous studies. Having selected the most appropriate indicators for the social evaluation of the MSW management system in Aracruz (Brazil), the metrics and the questions required for their calculation were proposed.

13th of June, 16:30h

Diagnosis of the current implementation of sustainable criteria in the public procurement of canteen services in Spanish Universities.

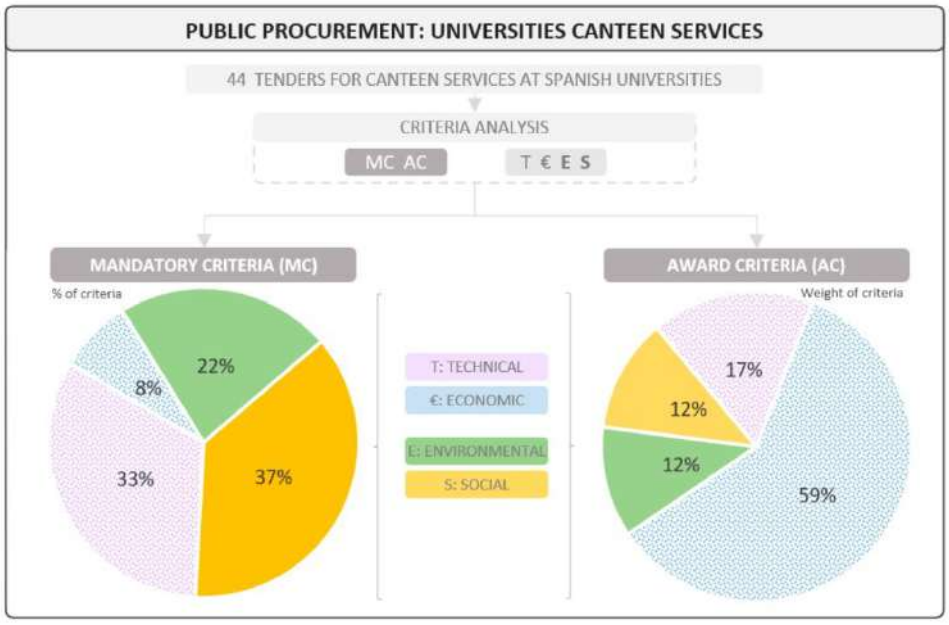
Karen Valls-Val, Valeria Ibáñez-Forés, María Dolores Bovea Edo.

Universitat Jaume I, Department of Mechanical Engineering and Construction, Castelló de la Plana, Spain;

Email: kvalls@uji.es

Sustainable Public Procurement (SPP) constitutes a potential policy instrument to reduce the environmental impact of products and services while generating social value for society. SPP practices are one of the key goals of the 2030 Agenda, being recognised as a key strategic component to achieve sustainable consumption and production patterns. In line with the 2030 Sustainable Development Strategy, universities have a central role to play in the transition towards sustainable and circular models.

In this context, the aim of this study is to carry out a diagnosis of the SPP criteria that Spanish universities are currently incorporating in their tendering processes. To this end, the canteen service tenders of Spanish public universities are analysed. This paper describes an in-depth analysis of the tender criteria. For each of the tenders studied, the criteria are identified and classified according to their typology (mandatory and award) and their related aspect (technical, economic, environmental, and social). In addition, the weight given to the award criteria is analysed. The results show a gradual integration of environmental and social criteria in the tenders, with the social criteria being emphasised over the environmental aspects. Although these aspects are mainly included as mandatory criteria, they represent a minor part in the weight during the award process. Therefore, research is needed to achieve a balance between technical-economic and environmental-social aspects.



13th of June, 16:48h

Atmospheric carbon dioxide capture and emissions reductions governance Out-line and Peri-urban agriculture for Sustainable food system in Vitoria-Gasteiz.

Óscar del Hierro[1], Jon Ruiz de Infante[2], María de Santiago[2], Neus Monllor[3], David González[4], Javier Chaves[5], Juan Latorre[6], Paul Iano[7]

[1]NEIKER. Instituto Vasco de Investigación y Desarrollo Agrario (NEIKER); [2]Centro de Estudios Ambientales (CEA); [3]AmaTerra SL (AMATERRA); [4]Sustraiak Habitat Design (SHD); [5]Francisco Javier Chaves Padilla (FJC); [6]Eraman Koop (ERAMAN); [7]COOPCYCLE (COOPCYCLE)

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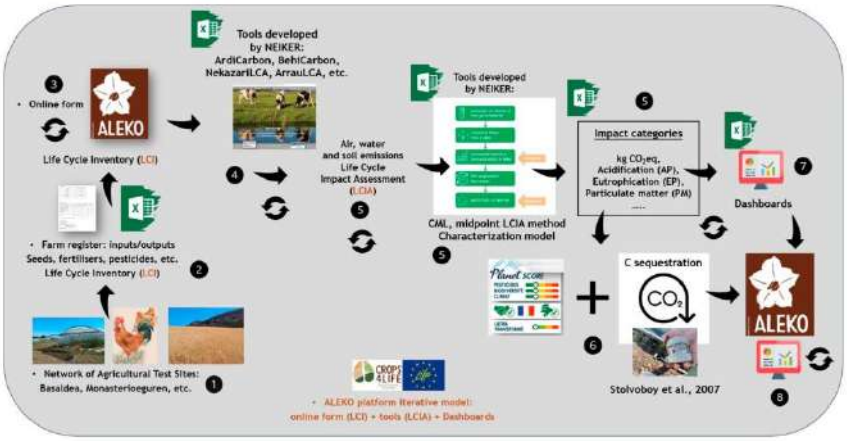
The main objective of the LIFE Crops4LIFE project is to establish a digital adaptive governance model aimed at reducing the environmental impact of the agri-food system in Vitoria-Gasteiz. This new model aims to change consumption patterns by providing consumers with environmental information to change behaviour and facilitates equitable access to affordable, sustainable and healthy food. Crops4LIFE aims to encourage behavioural change in people's food purchasing habits by quantifying the production and environmental profile of the product and incorporating it as a purchasing decision factor. To this end, the project will provide consumers in Vitoria-Gasteiz with an iterative platform (ALEKO) where the main impact categories associated with food production will be shown through a series of key performance indicator (KPIs) aligned with the environmental label Planet Score. Thus, ALEKO platform guarantees an environmental label based on life cycle approach that provides the Life Cycle Impact Assessment (LCIA) of the collected Life Cycle Inventory (LCI) data according to CML midpoint characterization model through specific tools developed by NEIKER and implemented in the platform, and which includes a series of additional indicators to reflect those externalities that are not sufficiently taken into account in the Life Cycle Assessment (LCA) methodology (pesticide consumption, biodiversity, carbon sequestration and animal welfare). The project pays particular attention in the soil sampling to certify the changes of organic carbon stock in mineral soil due to the implementation of regenerative agricultural practices in the agricultural test sites established in the framework of the project.



13th of June, 17:06h

Challenges and opportunities in the direct recycling of new-generation cobalt-free cathode material.

Stiven Lopez Guzman [1,2], Marine Reynaud[1], Marcus Fehse[1], Montserrat Galceran[1]

[1]Center for Cooperative Research on Alternative Energies (CIC energiGUNE), Basque Research and Technology Alliance (BRTA), Alava Technology Park, Albert Einstein 48, , Vitoria-Gasteiz, Spain;
[2] Chemical and Environmental Engineering Department, Faculty of Science and Technology, University of the Basque Country, UPV/EHU, B Sarriena, Leoia, Spain.

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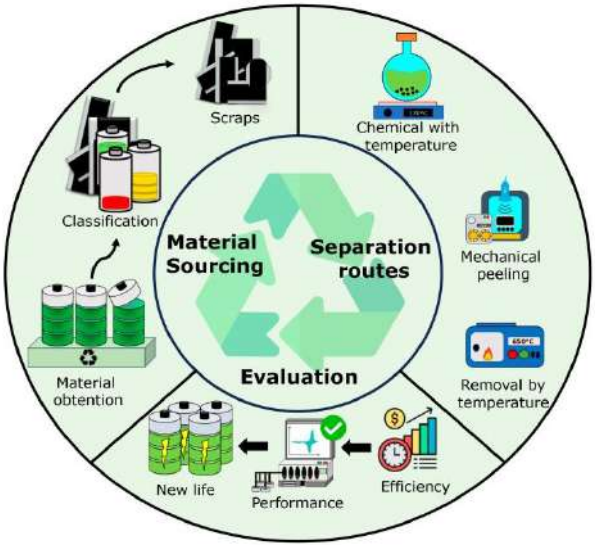
The utilization of Direct Recycling (DR) presents a new and alternative method for recovering active materials like anode and cathode while maintaining or improving their intrinsic properties without impurities. In this study, we investigate the recycling of out-of-specification or trimmed LiNi0.5Mn1.5O4 Spinel (LNMO) electrode scraps using three separation techniques involving: chemical solvents, mechanical ultrasonic waves, and thermal treatment. Our analysis compares the effectiveness of each method and addresses the challenges and opportunities for process refinement/improvement/optimization. To ensure the integrity of the recovered materials, a comprehensive material characterization procedure is carried out to identify material alterations or undesired components in the samples. The results demonstrate that the thermal treatment method is the most direct and efficient, with a 99% recovery rate of the active material. While the chemical and mechanical methods are also highly effective, they require multiple processing steps, resulting in a lower material recovery rate (<90%). DR is expected to significantly reduce energy expenses and carbon emissions associated with recycling materials by requiring fewer steps to reintroduce the material into battery life cycle compared to other recycling techniques. Our findings emphasize the importance of direct recycling as a viable approach to resource recovery, highlighting the need for continuous research and innovation in this critical domain.



13th of June, 17:24h

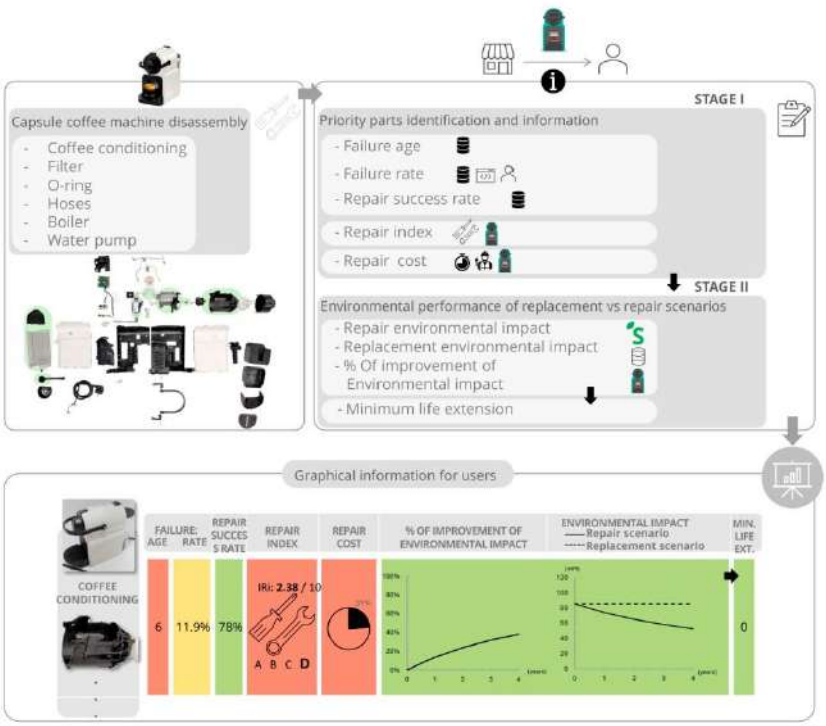
Information for repair decision: consumer implications from environmental and economic perspectives.

Eduardo Blanco-Espeleta[1,2], Victoria Pérez-Belis[1], María D. Bovea[2]

[1]*Politècnica de València, Project Management, Innovation and Sustainability Research Centre (PRINS) València, Spain;*
[2]*Universitat Jaume I, Department of Mechanical Engineering and Construction, Castellón, Spain.*

Email: eblaesp@upv.es

In the context of the "Right to Repair" recently adopted by the European Commission, this study aims to contribute towards consumer empowerment through the identification of information able to facilitate consumer decision-making regarding the reparability of products. In order to achieve this objective, a capsule coffee machine was selected as a case study. To this end, the priority parts were identified and the following information obtained for each part: failure rate, failure age, success repair rate, repair cost, repair index, and the environmental performance of replacement and repair scenarios after the failure of each priority part. It was observed that prioritising the repair of components with a high failure rate and ease of repair brings significant environmental benefits. Empowering the consumer with transparent information on repairability is therefore crucial in order to extend the lifetime of products and move towards a circular economy.



13th of June, 17:42h

Where does employment really occur due to investments in wind energy?

Guillermo Rodríguez[1], Ignacio Cazcarro[2], Jorge Bielsa[1], Sebastián García.

[1]Universidad de Zaragoza, Dep. of Economic Analysis, Zaragoza, Spain; [2]ARAID. IA2. Dep. of Economic Analysis / Assoc. Researcher at BC3, Zaragoza, Spain.

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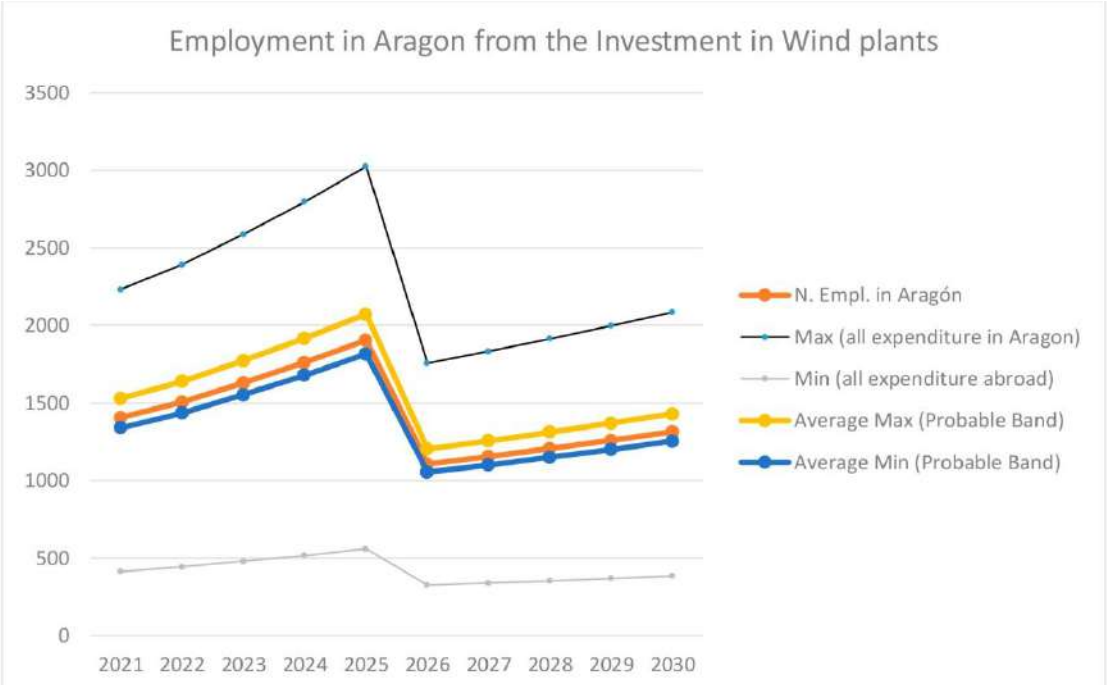
Growing concern about climate change has led to a significant volume of planned investments in wind energy in the European Union. This work focuses on the employment effects of the deployment of this technology in a region (Aragon, North-eastern Spain) among the top in Spain in generation and even more in wind investments in the country. To this end, we have created a multi-regional input-output (MRIO) dataset and model in order to locate and explain the dynamics of those employment effects. The contribution to the existing literature consists of the fine-grained scale, across time, spatial locations and sectors of our model, dataset and hence results. For greater robustness, we have analyzed the effects under different assumptions or scenarios depending on the temporal and conceptual scope and the geographical origin of the production of goods and services associated with the investments. The results of this study are then an estimate of the employment generated specifying the economic sectors in which they are needed, the spatial locations where those jobs will most likely be created and how long they would last. With clear applicability to other contexts, the article enriches, the policy dilemmas in energy transition, and more specifically the currently hot social discussion on the local and regional effects, impacts, benefits, costs, etc. of renewable energies, which are implying social controversy.



ENERGY

14th of June 2024, 11:00h - 14:00h

Coordination: Erlantz Lizundia

Life Cycle Thinking Group · Universidad del País Vasco · Euskal Herriko Unibertsitatea · medicusmundi · Garapenerako Lankidetzaren Euskal Agentzia · Agencia Vasca de Cooperación para el Desarrollo · Ayuntamiento de Vitoria-Gasteiz · Vitoria-Gasteizko Udala · CEA · ekopol · ihobe ingurumen hobekuntza mejora ambiental

14th of June, 11:00h

Optimisation of passive energy renovation strategies in residential buildings for life cycle global warming potential reduction and cost-effectiveness

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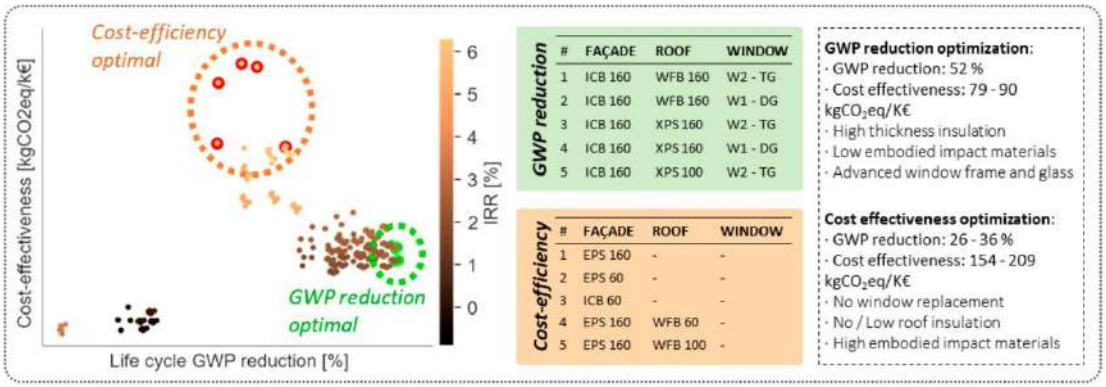
The European Union (EU) regulations claim an efficient evaluation of the building renovation processes, highlighting the quantification of the life cycle carbon and cost-efficiency, towards the carbon-neutrality targets of the EU. The integration of the life cycle thinking (LCT) in the environmental field – the life cycle assessment (LCA) – and the economic field – the life cycle cost (LCC) – are the most promising methodologies for the required assessment, together with the building performance simulation (BPS). A previous publication proposed the "PARARENOVATE-LCT" novel tool to answer to this challenge as a new approach in the parametric enviro-economic evaluation of energy renovation strategies in residential buildings with life cycle thinking. This study presents the optimisation process for residential building renovation strategies as an application of the novel tool. The study aims to perform the optimisation of passive energy renovation strategies in residential buildings towards efficient life cycle carbon reduction. For that, firstly, we define the evaluation scope, case study and life cycle inventory (LCI); secondly, we evaluate each of the 245 scenarios composed by all the combinations of different types of intervention in façade, roof and windows; and thirdly, we carry out the optimisation in terms of the optimal life cycle GWP reduction and cost-efficiency. The results show that the optimal GWP reduction renovation strategies can reduce more than half the GWP but with a lower cost-efficiency in comparison to the optimal cost-efficient strategies. Moreover, the embodied impact is not significant in the life cycle GWP impact. Besides, optimal cost-efficient renovation strategies achieve highly efficient GWP reduction but with a significantly lower GWP reduction in comparison to the optimal GWP reduction strategies, applying medium thickness insulation in the façade and without any intervention in the roof and windows.



14th of June, 11:18h

Material footprint of rooftop photovoltaics in the city of Vitoria-Gasteiz.

Alex Tro-Cabrera[1], Emmanuel Aramendia[2], Estitxu Villamor[3], Leire Urkidi[4], Rosa Lago-Aurrekoetxea[5]

[1]EKOPOL research group, Department of Electronics Engineering, University of the Basque Country (UPV/EHU), Bilbao, Spain; [2]Sustainability Research Institute, University of Leeds, Leeds, UK; [3]EKOPOL research group, Department of Physics (UPV/EHU), Vitoria-Gasteiz, Spain; [4]EKOPOL research group, Department of Geography (UPV/EHU), Vitoria-Gasteiz, Spain; [5]EKOPOL research group, Department of Electronics Engineering (UPV/EHU), Bilbao, Spain.

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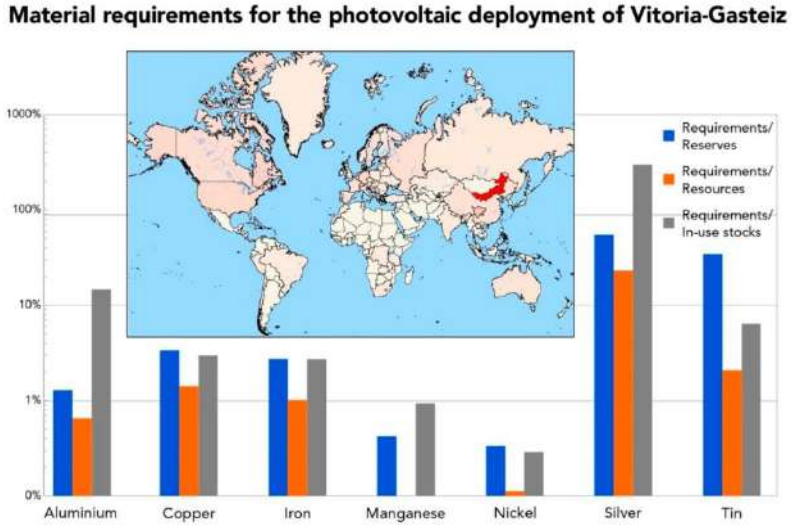
In this study we investigate the material requirements and environmental impacts of rooftop photovoltaic (PV) installations, focusing on their implications for sustainable energy transitions. Utilizing a comprehensive methodology, we compare the material demands of PV deployment in the rooftops of Vitoria-Gasteiz to global reserves, resources and in-use stocks, alongside conducting a Life Cycle Assessment (LCA) to evaluate its environmental impacts and the locations where they would be generated. The results reveal high ratios of material requirements to reserves for critical materials such as tin (34.5%) and specially silver (54.9%), which would quadruple the current in-use stocks, indicating potential pressure on exploration and mining. Additionally, the LCA study highlights the complex interplay between different PV installation methods and their environmental implications. For instance, our analysis shows that rooftop PV demonstrates advantages over on-ground PV in fossil resource scarcity (with an 83% reduction) and land use efficiency (occupying only 19%), but faces challenges in reducing global warming and water consumption (with an increment of 10% and 2%, respectively, when comparing to on-ground PV). These outcomes underscore the necessity for informed policy decisions and cautious approaches to address regional and global implications effectively, ensuring a sustainable transition towards renewable energy sources.



14th of June, 11:36h

Spanish carbon footprint estimates at NUTS 2 level.

Arkaitz Usubiaga-Liaño, María Victoria Román, Iñaki Arto

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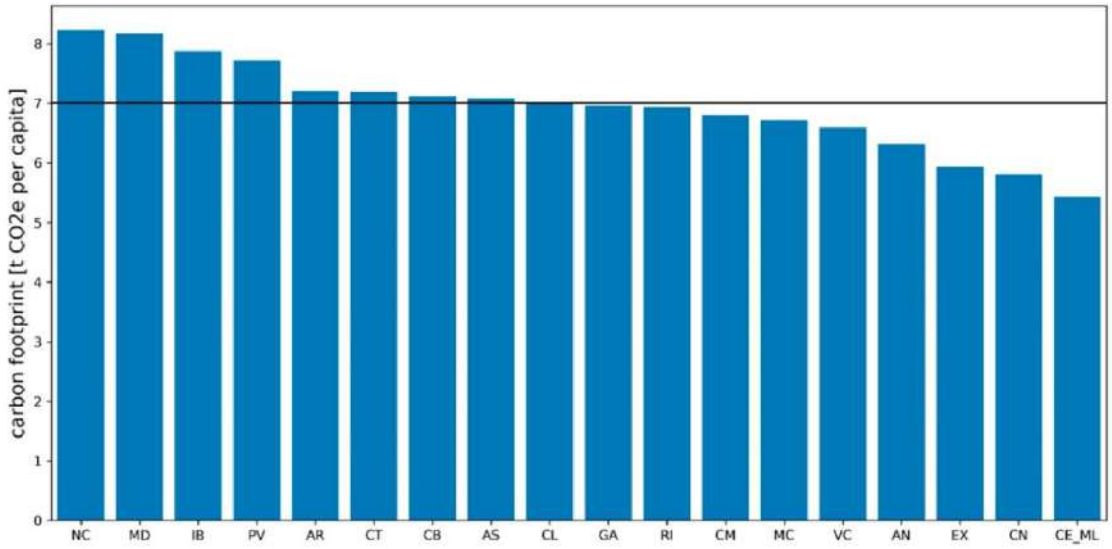
Meeting Spanish long-term climate targets will require a combination of changes not only in production systems, but also in consumption patterns. Given the predominant national focus, the insights provided by footprints might be difficult to translate to the regional level, where geographical, socioeconomic, technological and cultural differences could lead to very diverse footprint levels. Against this background, this paper estimates household carbon footprints for Spanish NUTS 2 regions for the period 2010-2021 combining multi-regional input-output tables and household budget surveys.

The results show that regional footprints range between 5.43-8.23 t CO2e per capita in 2019In terms of structure, private transport, food and residential energy use tend to be the most important consumption categories. At the bottom, health, communication and education are always the least important categories. Overall, Spanish regions have reduced their carbon footprints between 4-21% in the period 2010-2019, although the absolute values are still considerably higher than those considered sustainable. Most of this reduction can be attributed to reductions in domestic emissions, given that these also contribute to reducing carbon footprints.

Despite their potential to contribute to reduce both domestic emissions and footprints, the consumption perspective is not sufficiently integrated in Spanish climate mitigation policies. To overcome this problem, carbon footprints could be reported as official statistics at the national level as done in countries like Sweden and the United Kingdom. This could raise the awareness of the general public, thereby increasing acceptance of potential policies through taxes, subsidies or information provision aimed at nudging consumption in the right direction.



14th of June, 11:54h

Sustainable Energy Storage: Advancing Sodium Batteries with Biopolymers.

Mireia Martín[1, 2], Nagore Ortiz Vitoriano[2, 3], Erlantz Lizundia Fernandez[1, 4]

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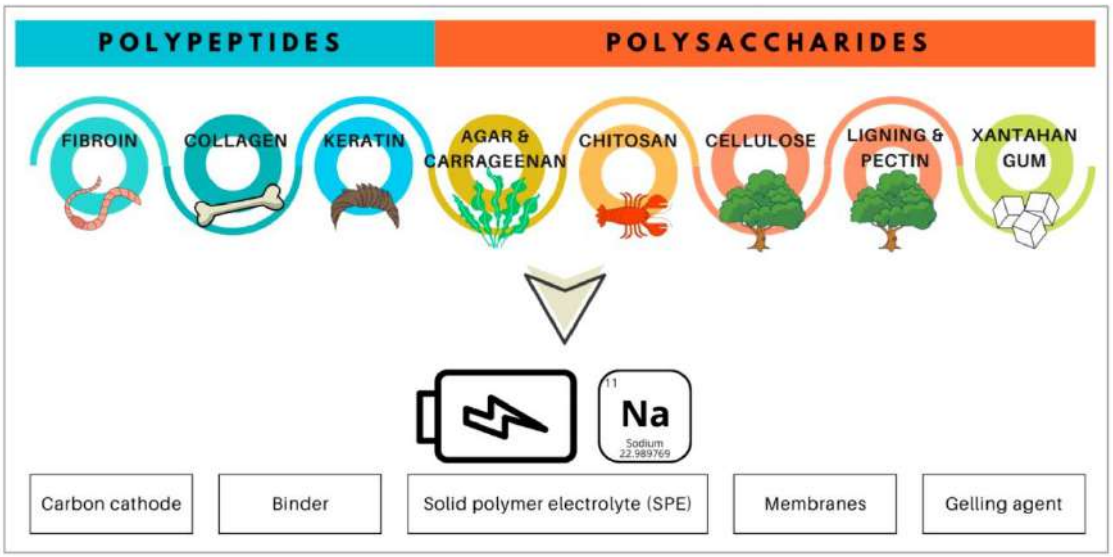
In the search for sustainable and environmentally friendly alternatives in the energy storage sector, sodium batteries have emerged as a promising option to address the challenges associated with conventional energy storage technologies such as lithium-ion batteries. However, the potential of sodium batteries to offer a more sustainable solution is further amplified with the integration of biopolymers, macromolecules derived from renewable sources. Natural biopolymers including cellulose, chitin and chitosan offer attractive characteristics to serve as battery separators and electrolytes. Besides, biomass residues can be utilized as valuable renewable source to obtain carbonaceous materials that perform well as battery electrodes. Herein, we will explore the synergy between biopolymers and sodium ion/oxygen batteries, examining their role in building a cleaner and more sustainable future.



14th of June, 12:12h

Business Model patterns for Renewable Energy Communities.

Lierni Rabanete Gonzalez[1], Dorleta Ibarra Zuluaga[1], Joan Manuel F.Mendoza[1, 2]

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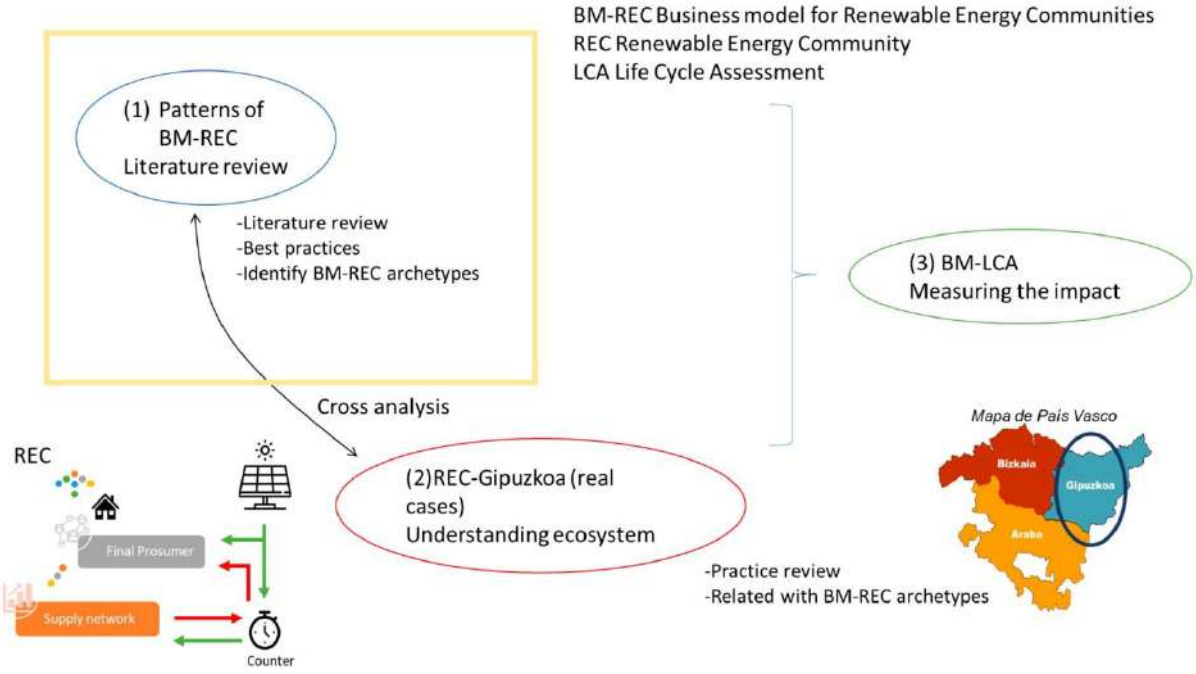
The legislative framework "Clean Energy for All Europeans" introduced the concept of Renewable Energy Communities RECs, aiming to empower citizens by granting them greater decision-making authority and control over their energy consumption, and now we are facing a surge in energy communities, supported by legislation, and a growing interest in Circular Business Models (CBMs). However, there is a lack of archetypes for Business Models for Renewable Energy Communities and of a framework to define if energy communities are sustainable departing from traditional energy sector frameworks. This article proposes a Design Research Methodology (DRM) to investigate and develop circular and sustainable business models (CSBMs) for RECs, focusing on the region of Gipuzkoa. The process involved initial list of Business Models for Renewable Energy Communities (BMRECs) from literature source, characterization, patterns identification (grouping related strategies), and refinement to eliminate overlaps. The study aims to establish BMREC archetypes for best practice extraction and sustainability assessment, alongside developing a framework for integrating circular and sustainable principles into energy community business models.



14th of June, 12:30h

Energy footprint of Spanish households according to regional and socioeconomic characteristics.

Estitxu Villamor[1], Ortzi Akizu-Gardoki[2], Erlantz Lizundia[2,3]

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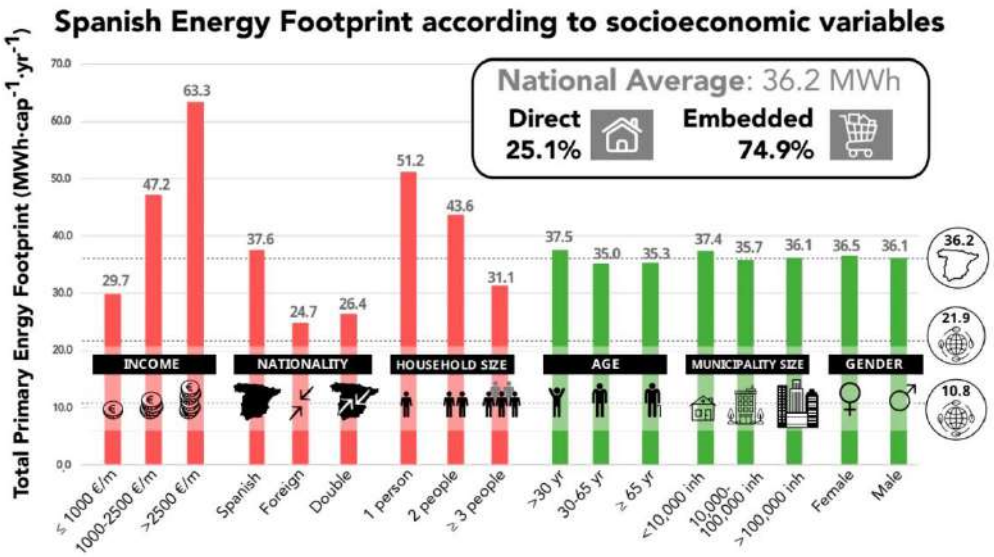
It is urgent to reduce global energy consumption to achieve the ambitious climate targets set for 2030-2050. Given that consummers are the ultimate responsible for the impacts of the energy and goods they purchase, this study aims to shed light on what socioeconomic factors are behind the most sustainable patterns. Global Multi-Regional Input-Output methodology was combined with microdata from Spanish Household Budget Surveys for calculating the total primary energy footprint (TPEF) across different regions and socioeconomic segments. Whereas national average TPEF is 36.2 MWh·cap-1·yr-1, the indirect energy footprint is 27.1 MWh·cap-1·yr-1 (a 74.9% of the TPEF), which shows the importance of the production and consumption system on the total energy footprint, above the direct energy consumption. The regional TPEF and the Gross Domestic Product (GDP) are strongly correlated as wealthier (northern) regions have a TPEF 17.6% over national average, while poorer regions present a 31.6% decrease. Additionally, the variables that significantly alter the TPEF are income, household size, and nationality. Households with high income have a 75% higher footprint than national average, while individuals living alone show a 41.1% larger TPEF. Contrarily, foreign households present a 31.8% lower TPEF. Gender, age, or municipality size do not significantly influence energy footprint.



14th of June, 12:48h

System Dynamics Analysis of Hydrogen Potential and Limitations for Energy Transition.

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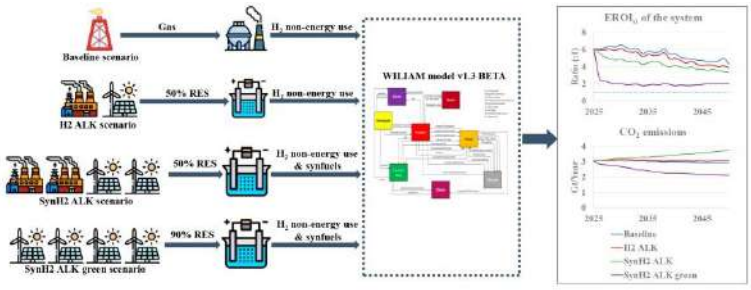
Institutional transition plans towards achieving a net zero emissions energy system identifies green hydrogen as a key player in decarbonizing industries and sectors facing challenges in reducing emissions. However, uncertainties persist due to technological immaturity and specific physical-chemical characteristics. Furthermore, hydrogen-based technologies necessitate significant material inputs, some of which are deemed "critical" for future sustainability. This paper evaluates the role of hydrogen in the energy transition, focusing on indicators of net energy balance, greenhouse gas (GHG) emissions, energy and water consumption, and dependence on raw materials. Using the Energy Returned on Energy Invested and the Energy Stored on Energy Invested (EROI and ESOI) indicators, the paper scrutinizes the net balance and societal welfare implications. Existing studies often overlook critical materials and tend to overestimate the EROI and ESOI for hydrogen. The study employs a dynamic modelling approach using the WILIAM (Within Limits Integrated Assessment Model) model, which incorporates regional dimensions allowing to test long-term scenarios (2050 - 2060). Methodologically, the study reviews hydrogen technologies, gathers technical parameters, and evaluates mineral resources and reserves. Static calculations of EROI and ESOI encompass plant construction, operation, and decommissioning, while dynamic calculations integrate these parameters into the WILIAM model. Four scenarios are formulated and tested with different assumptions about the level of usage of hydrogen and synthetic fuels, generation technology (% electrolyzers) and share of renewables in the electricity mix. In all the scenarios, the EROI of the system decreases, especially in those with a higher share of renewables. Carbon dioxide emissions vary according to the scenario, being higher if there is a high presence of electrolytic hydrogen with a low share of renewables. Finally, electricity consumption increases significantly with the increase of electrolysers.



14th of June, 13:06h

Environmental impacts of oil extraction in the Yasuní Reserve of the Amazonian Forest: combined qualitative and Life-Cycle Assessment.

Jacid Montoya Torres[1], Cinta Eugenio[2], Ortzi Akizu-Gardoki[2], Leire Urkidi[3], Unai Villalba[4], Carlos Larrea[5], Sylvia Pappuccio[5], Angélica Calle[5]

[1]*ELITE Research Group, School of Business, Engineering and Technology (ESEIT);* [2]*University of the Basque Country (UPV/EHU), Department of Graphic Design and Engineering Projects;* [3]*University of the Basque Country (UPV/EHU), Ekopol: Transition Pathways Research Group;* [4]*Hegoa Institute for International Cooperation and Development Studies;* [5]*Universidad Andina Simón Bolívar (UASB), Área de Ambiente y Sustentabilidad*

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This research analyses 24 years of oil extraction in blocks 16 and 67 of the Yasuní National Park (YNP) in the Amazonian Forest of Ecuador, a space with presence of ancient indigenous communities. As a novel contribution, we have carried out a Life-Cycle Assessment (LCA) that quantifies the footprints associated with the extraction, transportation, refining, distribution and final uses of the oil in four different scenarios (oil for asphalt use, electricity, marine fuel and passenger car transport). This study also sheds light on the energy return at the point of use of different oil-derivatives, and complements this with a qualitative analysis of the social, cultural and environmental implications for the Waorani communities. We conclude that the environmental burdens of the extraction process in blocks 16 and 67 in 2015 were greater than those of countries such as the United States, Saudi Arabia and Indonesia, based on the analysis of 11 impact categories. The blocks' operation is the most unfavourable for the categories of Terrestrial Acidification Potential (TAP), Global Warming Potential (GWP), Terrestrial Ecotoxicity Potential (TEP) and Ecosystem Quality Loss Potential (EQL), with increments of 804.15%, 105.36%, 506.29% and 210.73%, respectively, in relation to the average of the rest of the extraction systems analysed. Specifically, the present case study shows 75.18% higher impacts in the blocks addressed, when compared to the Ecuadorian average. For the period 1999-2022, the carbon emissions associated with the oil extraction in these blocks have increased by 139.01%. Meanwhile, the Ecuadorian state, the Spanish government and the oil companies received, on average, 21%, 38% and 41% of the per-litre average fuel price. We conclude that, on average, 19.64% of the impacts associated with crude oil production and consumption occur in the Amazonian region of the YNP, depending on the fuel used and the consumption mechanism. For the Global Warming Potential (GWP) impact category, the extraction process carries, on average, 34.51% of the weight in all of the life-cycle impacts, depending on the consumption scenario. It was also estimated that to be able to use 0.33 kWh of electricity from fuel combustion, 0.47 kWh of energy for goods transport and 0.20 kWh for passenger transport, an investment of 1 kWh is required, with an average extended Energy Return On Investment (EROI) of 1:3.33. According to the qualitative analysis performed, it has been concluded that the main local impacts are related to the obstacles in environmental monitoring and information, the economic dependence of the communities on the company, and cultural transformations; impacts that are not easily quantifiable or detectable using other methodologies. The combination of the diverse methods used gives us a much more complete picture of the impacts of oil extraction, in this case for the Ecuadorian Amazon.

14th of June, 13:24h

Applicability of circular indicators in the assessment of wind turbine blade end-of-life management alternatives.

Marta Diez Viera[1], Eider Mendiburu Valor[1], Joan Manuel F. Mendoza[1, 2]

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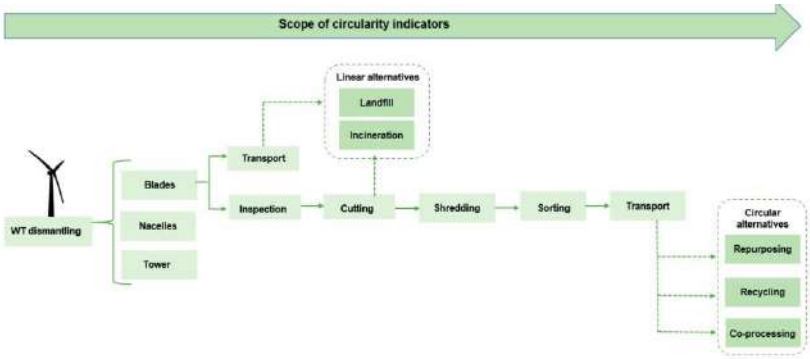
Due to the large number of wind turbines (WT) installed worldwide in the last two decades, large amounts of WT waste will be generated in the near future as the assets are approaching the end of their design life (20-25 years). The WT blades (WTBs) are made of composite materials, which pose technical and economic challenges for material recycling. Until now, WTB wastes have been managed through incineration and landfilling, but the European Union (EU) started to launch landfill bans and restricting incineration methods in favour for more circular strategies, such as WTB repurposing, recycling and/or cement co-processing. However, there is a lack of literature that analyses the actual circularity and sustainability performance of alternative WTB end-of-life (EoL) management practices, by relying on the consideration of circularity metrics. This can constrain future decision-making processes for the sustainable design and life cycle management of WTBs and WTs as a whole. Accordingly, this research explores the actual applicability of multiple circularity metrics to analyse the circularity performance of WTBs undergoing different EoL management scenarios: repurposing, recycling and co-processing. For this purpose, a systematic literature review of circularity metrics was performed. Afterwards, the scope of the resulting sample of circularity metrics was assessed by relying on a number of checklists with a compilation of predefined circularity criteria. This first helped classify indicators by life cycle stages, circularity strategies, resource inflows and outflows, sustainability dimensions and WTB-EoL management processes to get an overview of the current gaps related to their application to the sector. This, in turn, helped to identify improvement opportunities to develop specific circularity metrics for use by the wind industry for the sustainable life cycle management of WTBs. The results show that the indicators do not cover the entire WTB-EoL management alternatives and/or processes. They only contemplate certain aspects of these processes, leaving out elements such as transportation, logistics, material quality or some economic variables. This raises the need to develop specific indicators for the wind industry that can cover all aspects of the processes.



14th of June, 13:42h

Regenerative Design in Photovoltaic Solar Systems: The Canela Solar Park Project.

Felipe Díaz-Alvarado[1], Alejandro Chacón[2]

[1]*Universidad de Chile, Department of Chemical Engineering, Biotechnology, and Materials, Santiago, Chile;* [2]*Ecodiseño.cl, Santiago, Chile,*

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In the commune of Canela, located 300 kilometers north of Santiago, Chile, plans are underway to construct the first regenerative photovoltaic solar plant, the Canela Regenerative Solar Park (PSR Canela). This semi-arid region has tragically experienced the loss of the ecosystem's regenerative capacities. Where food and fodder were cultivated two decades ago, nothing grows now, resulting in human and non-human inhabitants abandoning the area. The PSR Canela is envisioned to regenerate the soil where it will be installed, reviving life below and above the surface and restoring the water cycle, social dynamics, and cultural practices lost. PSR Canela comes from a virtuous interaction of various fields of knowledge, including Eco-design, syntropic agriculture, biodigesters, cultural change management, and agrivoltaics, combining diverse areas of expertise from design and engineering.

When the plant is operational, the question is which strategic variables will be measured to monitor the project and assign sustainability scores to determine whether the plant and its outcomes can be signed as regenerative.

JUSTICE

14th of June 2024, 15:00h - 18:00h

Coordination: Estitxu Villamor

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14th of June, 15:00h

The journey of a discarded t-shirt: from the Global North to the Atacama illegal landfill.

Gemma Morell-Delgado[1], Laura Talens Peiró[1], Susana Toboso-Chavero[1, 2, 3]

[1]*Sostenipra Research Group (2021SGR 00734), Institut de Ciència i Tecnologia Ambientals (ICTA-UAB, 'Maria de Maeztu'unit of excellence CEX2019-000940-M), Universitat Autònoma de Barcelona, Cerdanyola del Vallès, Barcelona, Spain;*[2]*Rotterdam School of Management, Erasmus University Rotterdam, Rotterdam, the Netherlands;* [3]*Integral Design and Management, Department of Materials, Mechanics, Management & Design, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, the Netherlands*

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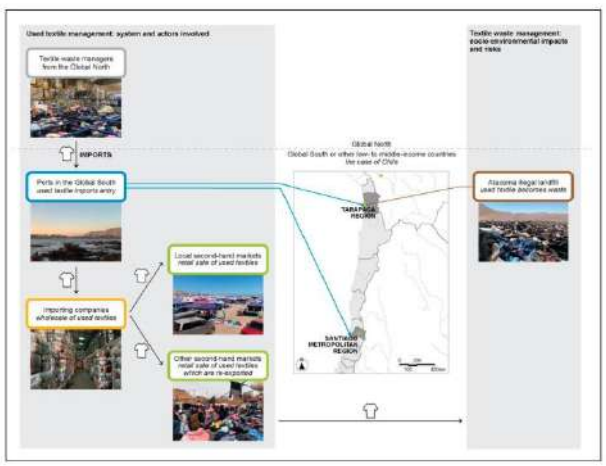
The management of textile waste is becoming an increasingly pressing concern, given the widespread consumption of textiles and the consequent generation of waste. Strategies for managing textile waste prioritize reuse and recycling over incineration and landfilling. However, the valorization of used textiles through reuse and recycling currently involves exports to the Global South and low- to middle-income countries, leading to socio-environmental impacts and risks in recipient countries. This study constitutes an initial phase of ongoing research. The objective of this study is to examine the system of used textile management in an importing region, with the aim of developing a methodology to assess the socio-environmental impacts of used textile trade practices in importing countries. The case study approach was employed, focusing on the Tarapacá and Santiago Metropolitan Regions of Chile. Rapid ethnography methods were utilized. These included interviews and observation to gather primary data across eight locations, including ports, importer centres, second-hand markets, a recycling plant, and the Atacama landfill. The findings indicate that Chile's management system for imported used textiles is delineated by ports serving as entry points, wholesale sales by importing companies, retail sales in local second-hand markets, and disposal in informal landfills. The interviews conducted revealed that not all imported used textiles intended for reuse and recycling were utilized, contributing to socio-environmental impacts in importer countries. From a methodological perspective, the results demonstrated the importance of developing semi-structured interviews to address data deficiencies and to improve understanding of stakeholders' control and data knowledge over used textile fluxes with which they engage. Additionally, exploring stakeholders' relationships is essential. Further research should concentrate on the translation of insights derived from semi-structured interviews into indicators that serve to quantify the environmental justice implications of the used textile trade. Such endeavours are of critical importance for the management of used textiles in both exporting and importing regions.



14th of June, 15:18h

Measuring footprints of agri-food consumption with Agro-SCAN, a new Multi-Regional Input-Output database

María Victoria Román[1], Iñaki Arto[1]; Ignacio Cazcarro[2]; Neus Escobar[1], Martin Bruckner[3], María José Sanz[1]

[1]Basque Centre for Climate Change, Low Carbon Research Line, Leioa, Spain; [2]Aragonese Agency for Research and Development (ARAID), Agri-food Institute of Aragon (IA2), Zaragoza, Spain; [3]ETH Zurich, Institute of Environmental Engineering / Vienna University of Economics and Business, Institute for Ecological Economics, Vienna, Austria

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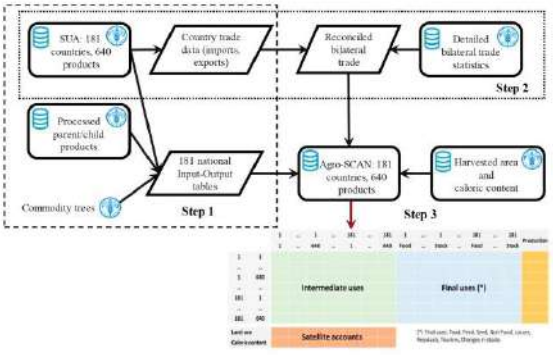
The globalisation of agricultural markets and international trade is linked to the geographical relocation of agricultural activities and subsequent environmental burdens around the world, including agricultural land expansion and deforestation. Assessing interdependencies along increasingly complex supply chains is key to understanding the drivers of the global impact of agri-food consumption and associated environmental footprints. We present a physical Multi-Regional Input-Output (MRIO) model that tracks production, transformation, final, and bilateral trade in tonnes, for 640 products in 181 countries in the period 2013-2020. This study describes the construction of Agro-SCAN from publicly and non-publicly available FAOSTAT data and illustrates part of its potential by estimating 1) cropland footprints of cocoa derivatives; and 2) calorie footprints of food and feed imports from Ukraine and Russia. In 2020, 10.6 Mha were embodied in exported cocoa beans and derivatives, which corresponds to 83.7% of the global area harvested in that year. Agro-SCAN also shows how Eastern European and Mediterranean African countries are the most calorie dependent on imported crops from Ukraine and Russia, making their food and feed supply more vulnerable to export shortages from these two countries. The model presented here is able to trace crop-based supply chains up to final demand for food, feed and other non-food uses at an unprecedented level of product detail, while improvements are being made to fully represent livestock products. Agro-SCAN brings transparency to global agri-food supply chains and provides quantitative evidence for the accountability of the impacts of food consumption. Results bear potential to inform stakeholders' decisions towards more sustainable production, consumption, and trade practices.



14th of June, 15:36h

Integration of Life Cycle Assessment (LCA) knowledge in the Environmental Sciences Degree: Analysing the andalusian universities

Luz Marina Ruiz Hernández, Jaime Martín Pascual, Montserrat Zamorano Toro

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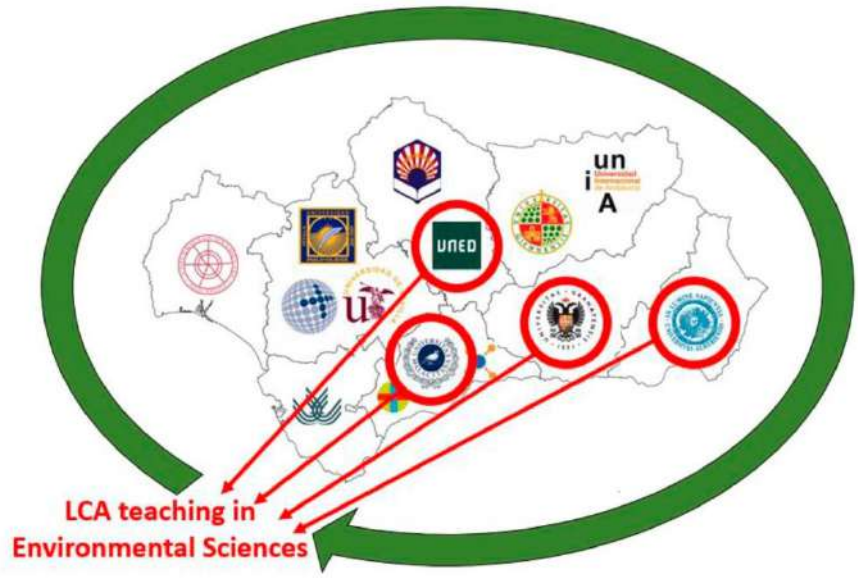
In the last decades, as the world becomes more environmentally conscious, there is a growing need for sustainability professionals with expertise in the use of tools such as life cycle assessment (LCA). In this context, universities play an important role as source of well-trained specialists and several universities have already integrated this topic in their programmes. However, in many other universities, it is not yet included. This work evaluates the level of integration of LCA into the Environmental Sciences Degree programmes of the andalusian universities. Results showed that only 9 of the 14 andalusian universities offer a degree in Environmental Sciences, 3 of them do not mention the concept of LCA in their programmes and only the Universities of Malaga, Granada and UNED explicitly mention LCA among their contents. Training on LCA is relevant for Environmental Sciences students, their engagement and interest on this topic is high but the workload required to the students, the absence of time available for introducing new topics in the existing curricula and the scarce use of commercial software in the Universities make it difficult to include LCA training in the existing curricula. The future of higher education will undoubtedly involve the integration of sustainability and, more specifically, the concept of LCA in different fields of knowledge, but to do so, we still must face a series of impediments that currently limit its development in University degrees.



14th of June, 15:54h

Biodegradability assessment of new biodegradable and compostable batteries: understanding the end-of-life scenarios.

Jonathan Michel Barba Godinez, Laura Talens, Teresa Gea, Raquel Barrena

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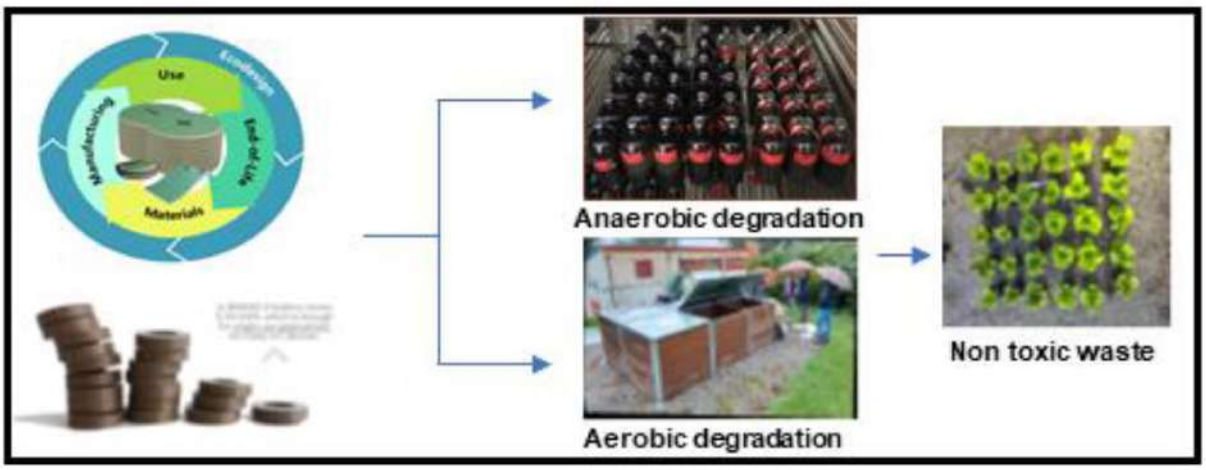
The growing imperative for sustainable living has driven the development of a variety of new biodegradable commercial products claimed as sustainable. The biodegradability assessment of these new products is a challenge in the absence of standard methods, available only for bioplastics. This work presents the biodegradability assessment of a new generation of biodegradable flow batteries. The battery prototypes have been eco-designed to meet a life cycle for precision agriculture (PA) applications; From raw material selection to disposable considerations, batteries have been designed to minimize their environmental impact while meeting energy requirements. Aerobic and anaerobic tests were conducted to assess the biodegradability and compostability of complete batteries and their individual components. Compost derived from battery degradation was analysed to ensure its safe use as organic amendment. Phytotoxicity indices using radish and cucumber models did not show inhibition in germination, indicating that the battery and its components are harmless to the environment. Additionally, scanning electron microscopy (SEM) revealed changes in the internal structure after degradation processes. All this data will contribute to the establishment of future protocols and standards for biodegradable/compostable batteries, and it can be utilized to quantify the impact of the various end-of-life scenarios for the battery.



14th of June, 16:12h

What does low-carbon living look like in Europe in various types of built environments?

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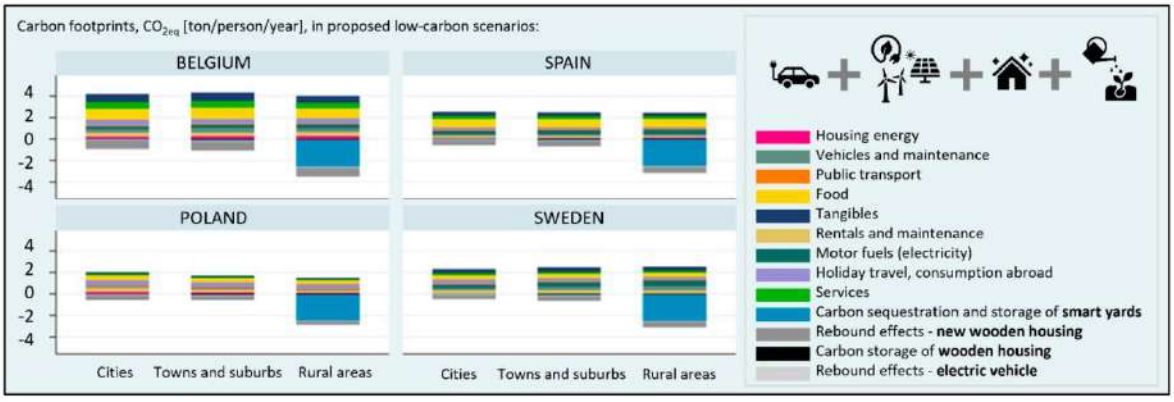
Consumption-based carbon footprints are declining in several European countries. Yet, the average carbon footprints of European citizens are still high compared to the global average. However, there are many available options for individuals to reduce their personal carbon footprints. This study illustrates the impacts of low-carbon living on personal carbon budgets in urban, suburban, and rural areas in four European countries. The main research material is Eurostat's Household Budget Survey 2015, which is combined with a global multi-regional input-output model, Exiobase, to assess carbon footprints. The dataset includes 250,000 households from 23 EU countries in total, but the study focuses on four countries: Belgium, Spain, Poland, and Sweden. The estimated impacts of low-carbon and carbon-negative solutions are based on previous literature. The analysis focuses on housing-related solutions, including renewable energy, low-carbon construction materials, and carbon sequestration and storage of private yards. Most alternatives analysed include monetary expenditure to minimize rebound effects. The findings reveal that it is possible for a typical European citizen with an average income to have a low-carbon or even carbon-negative lifestyle. To create momentum at the societal level, stronger incentives are needed, and current lock-ins and barriers need to be addressed.



14th of June, 16:30h

Amalur EIS: A system for calculating the environmental footprints of industrial sites from E-PRTR records

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Amalur EIS (https://www.amalur-eis.eus/) (Amalur meaning Mother Earth in the Basque language) is an Environmental Information System that automatically translates pollutant release metrics referenced in absolute units (e.g., kg NH4) to environmental impact indicators referenced in relative units (e.g., kg CO2 eq). This EIS can perform this translation for 78 pollutants in 388 impact categories covered by 31 Life Cycle Impact Assessment (LCIA) methods. The system has been constructed relying on a two-layer software infrastructure: (i) a data layer supported by a relational geodatabase built on PostGIS; (ii) a presentation layer built on Tableau, so it provides user-friendly access to the information.

The use of Amalur EIS allows for multidimensional analysis of industrial activity, cross-setting release data, diverse impact categories, industrial sectors, and several geographical areas along different hierarchical levels, from countries to regions, municipalities, or even postal districts. Amalur EIS is designed for continuous updating with the incorporation of new pollutant release data sources, and it is also prepared for expansion with climatic, socio-economic, or human development data. It is therefore a comprehensive, flexible, and analytically powerful tool. Its potential in terms of calculating industrial sectors' environmental footprints is enormous, so it is poised to be a very valuable and useful tool for tracking the transition towards sustainability, particularly in Europe currently. We are not aware of any public EIS currently available that offers Amalur's ability to calculate the environmental impact associated with pollutant releases from a multi-method, multi-category LCIA approach.

Among all the data input sources currently connected to Amalur EIS, two published by the European Environmental Agency (EEA) stand out; the 2021 database of E-PRTR industrial releases and the 2008 diffuse releases tile layers. Specifically, this communication will present two analyses carried out with Amalur EIS on the environmental impact of releases at Spanish NUTS3 level: (i) 2021 impact of facilities using the ReCiPe 2016 Endpoint (H) LCIA method; (ii) 2008 impact of facilities and diffuse sources using the EF 3.0 (adapted) LCIA method.

2021 Impact of releases from Spain facilities in E-PRTR.
ReCiPe 2016 Endpoint (H) grouped categories in DALY units.

14th of June, 16:48h

The journey of a discarded t-shirt: from the Global North to the Atacama illegal landfill.

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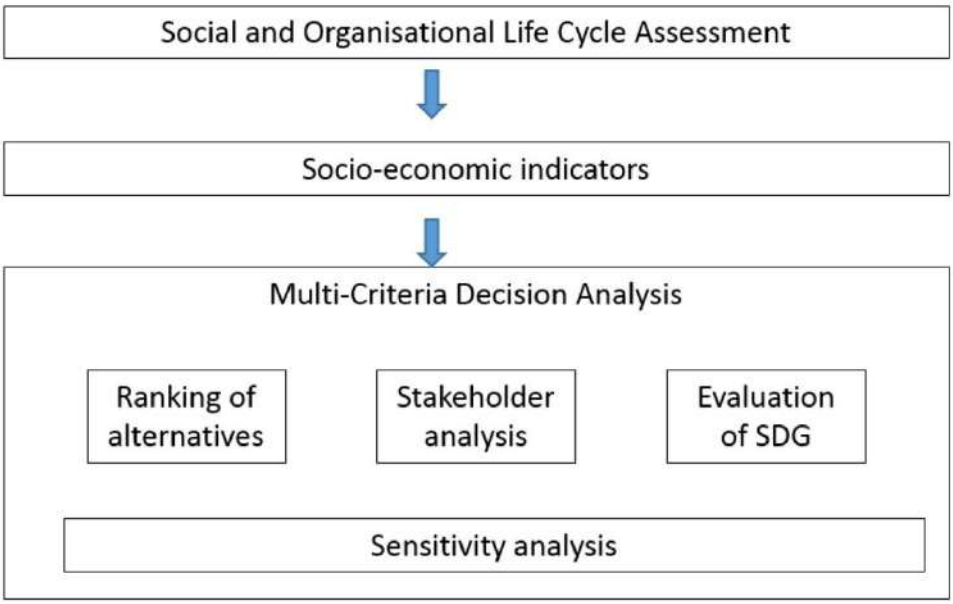
The evolution of Life Cycle Assessments opens the possibility to assess the social impacts of organizations. In this context, Social Organizational Life Cycle Assessment (SO-LCA) encompasses a promising framework to assess the social impacts of organizations, including Higher Education Institutions (HEI). However, despite recent advances, there are still important challenges to integrate and interpret the multiple social impacts of organizations. Furthermore, in these analyses the uneven distribution of social impacts in society remains largely unaddressed. To fill this gap, we develop and test a methodological approach that combines Multi-Criteria Evaluation techniques with SO-LCA analysis. Through a pilot case study, developed at the University of the Basque Country (UPV/EHU), we show the potential of this approach to improve the social impact of organizations in general and HEI in particular. We find that this framework can contribute to reduce the social footprints of universities by: (i) identifying the most suitable options, (ii) assessing the uneven distribution of social costs and benefits in society, (iii) quantifying the contribution of alternative strategies to sustainable development goals and, (iv) testing the robustness of the results through a sensitivity analysis.



14th of June, 17:06h

Exploring the Impact of Economic Incentives on Food Waste Reduction: The Moderating Role of Financial Constraints.

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Reducing consumer food waste by 20%-25% by 2030 could save the world $120-$300 billion annually. This benefits both individuals and the economy, as households can lower their food expenses. With global food waste costing $936 billion each year, cutting waste can save billions, create over 50,000 jobs, and conserve 45 trillion gallons of water annually. Technologies like dynamic food pricing can halve retail waste, boosting revenues and consumer savings. Addressing food waste offers significant economic and environmental benefits. Therefore, the purpose of this study is to explore the impact of economic incentives on food waste reduction in Turkey and examine the moderating role of financial constraints. Survey questionnaires were used to gather primary data for testing the research hypotheses. A total of 320 responses were collected, predominantly from individuals aged 30 and under. The findings provide evidence that economic incentives have a positive effect on reducing food waste based on several reasons discussed thoroughly in this paper. Additionally, financial constraints strengthen the effect of economic incentives on reducing food waste. This research offers an original perspective by examining how economic incentives influence food waste reduction, with a novel focus on the moderating effects of financial constraints. By integrating economic and behavioural insights, it provides a unique contribution to understanding the dynamics of food waste reduction in financially diverse populations.

A multi-criteria evaluation of shifting to local production in the textile sector: ORIENTING LCSA methodology application

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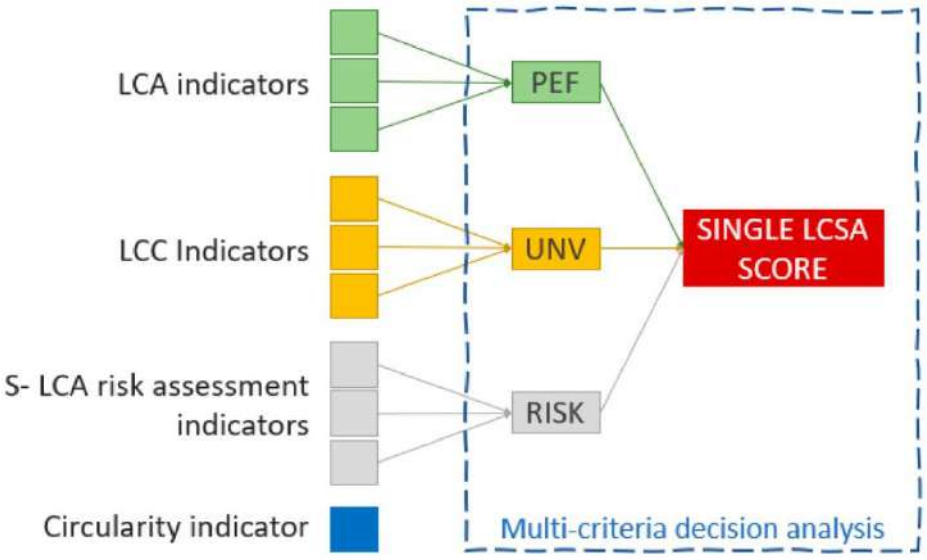
Textile industry is growing exponentially, especially due to fast fashion consumption trends in society. However, this means that companies must produce clothes with low costs, sometimes forgetting about environmental and social issues when making decisions about design and suppliers selection. To solve this, ORIENTING project has developed a novel operational methodology to conduct Life Cycle Sustainability Assessment at product level, considering the three domains of sustainability and also addressing circularity and criticality aspects. In addition, this methodology also allows to integrate all sustainability domains to reach a final single score, using several integration methods. In this abstract, this methodology has been applied to a textile product manufactured by Ternua group, a Basque textile company, with two main goals: to identify the main hotspots of the product and learn how to make more sustainable clothes, and to compare two different supply chains to check how impacts in the different domains can vary. The outcomes of the assessment show that the supply chain of textile products has a deep influence in the sustainability performance of the final product, and that upstream activities are the ones that have more room for improvement.



ACCESO A ENTREVISTAS

Para acceder a las entrevistas completas realizadas en el marco del Congreso Científico celebrado en junio de 2024:
https://drive.google.com/drive/folders/1LS1PChM1bx6C6xsXhursYB47ULxp8pTr?usp=drive_link