

SCIENTIFIC CONFERENCE

FOR THE CREATION OF SUSTAINABLE SOCIAL SCENARIOS

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Hub SG Collection 01



Global Sustainability
UNIVERSITAT DE BARCELONA

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Edited by:

Hub for Global Sustainability (Hub SG)
Universitat de Barcelona

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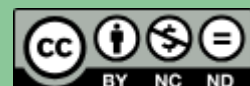
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Global Sustainability
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Table of contents

Presentation of the conference	3
Organisation	4
Program	6
Abstracts	7
Towards post-growth policymaking: Barriers and enablers for government-led sustainability initiatives	8
Participatory educational itineraries as a training proposal for imagining and building sustainable futures in initial teacher education. A GreenComp-informed diagnostic and pedagogical intervention	9
Three Proposals for European Private Contract Law Aimed at <i>Effective</i> Sustainability	10
REGENET: Enhancing Urban Water Sustainability through Laundry Greywater Regeneration and Reuse	11
Vulnerable groups and the digitalization of judicial proceedings: toward sustainable justice.	12
Modeling Arctic Freshwater Dynamics to Inform Global Climate Resilience and Sustainable Future Scenarios	13
Nanotechnology Education for Sustainable Futures: El legado de Nanoinventum, integrating MOOCs and Project-Based Learning through Nanorobot Design	14
Sustainable nitrate remediation techniques within a circular economy framework ...	15
Towards sustainable veterinary surveillance: environmental monitoring of bluetongue virus in farms and slaughterhouses.....	16
Necessary Cost or Irresponsible Excess? Public Legitimacy of Energy-Intensive AI Development and Sustainable Futures in Cross-Platform Discourse	17
Private law tools for the Renovation Wave.....	18
Citizenship as a driver of social sustainability: transforming mental health through participation and technological innovation	19
Participatory Scenario Planning for Transforming Urban Food Systems	20
Bioherbicides and Allelopathy in Rice: New Approaches to Sustainable Weed Control	21
Climate Change – “The Measure of All Things”: The Missing Map of Climate Narratives	22
New findings on the links between climate, soil natural capital and multifunctionality for sustainable and resilient agroecosystems.....	23
Designing and Validating an Educational Programme to Foster Transversal Sustainability Competencies in Higher Education	24

Towards Sustainable Urban Water Management: Stormwater Runoff Treatment for Reuse	25
The Third Mission of Universities as Hubs of Social Cohesion in Shaping Sustainable EU–Ukraine Futures	26
Large-Scale Evidence on Who Benefits from Off-grid Energy	27
Organic Rice and Sustainability in the Mediterranean: Implications for Global Health	28
Co-creation of productive and circular low-input farming systems	29
Developing Nature-Based-Solutions for Riparian Ecosystems restoration. From knowledge to practice (RiparianEcoRest)	30
Corporate Purpose from Within as Sustainable Organizational Future.....	31
Towards Integrated Metropolitan Mobility: Governance Instruments and Policy Dynamics in Spain	32
Integrated Assessment of Environmental and Social Sustainability for Industrial Heat Decarbonization in the Mediterranean	33
Cycle of Life: Farmhouses and Townhouses of Matarranya – Preserving Ethnological Heritage for Sustainable Rural Futures	34
List of researchers	35

Presentation of the conference

Dear Readers, Academic Community, and Participants,

We are pleased to present this book of abstracts, a compilation of the ideas and research on the occasion of the Scientific Conference for the Creation of Social Sustainable Scenarios. This event was conceived as an interdisciplinary encounter: a space for researchers and doctoral students to bring their expertise to the table and collectively imagine a viable future, and outline the steps needed to achieve it.

The event allowed for the integration of cross-cutting visions of knowledge to define realistic sustainability scenarios. Each abstract published within this volume represents a distinct vantage point addressing a central, vital question: *What will the future look like, and how can research contribute to building a world that is ecologically sound, economically fair, socially just, and technologically thoughtful?*

This initiative was presented to the institutional call for activities that foster synergies in research (2025) and was made possible through the Hub for Global Sustainability at the University of Barcelona, with the support of the Vice-Rectorate of Research.

The success of this conference and the publication of this book are the result of the institutional support and collaboration of the POLIS Research Center (Art, City, Sustainability), the research institutes in Biomedicine (IBUB), Education (IRE), Nutrition and Food Health (INSA), Complex Systems (UBICS), Biodiversity (IRBio), and Applied Economics (IREA), as well as the TransJus Institute, the Barcelona Economics Analysis Team (BEAT), the Chair of Energy Sustainability (IEB-UB) and the faculties of Chemistry and Biology.

This 27 abstracts have been submitted around the nine thematic nodes that structure the Hub, thus being:

- Climate change
- Mitigation of the anthropogenic impact
- Biodiversity conservation
- Energy and environmental transition
- Sustainable management of natural resources and ecological economics
- Healthy lives and prevention of new pandemics
- Safe and sustainable food Systems
- Urban and territorial transformation
- Education, communication and culture for sustainability.

Our sincere thanks go to the Vice-Rectorate for Research, our collaborating institutes, and every author and participant whose dedication and expertise made this possible. For those interested in revisiting the event, the recorded sessions of the conference can be accessed at this [link](#).

The Organising Committee
Barcelona, May 2026

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Program

Scientific Conference for the Creation of Sustainable Social Scenarios

19th May 2026

Aula Magna, Edifici Històric, Universitat de Barcelona

- 8:45 h Registration**
- 9:00 h Opening ceremony**
Jordi García Fernández – Vicerector of Research at UB
Rosina Gironès Llop – Coordinator of the Hub SG
- 9:10 h "Boundaries and guiderails for development and resilience in a Climate Century"**
Pep Canadell (CSIRO - GCP)
- 9:40 h "Rethinking Our Energy Mix to Shape Sustainable Futures"** Albert Tarancón Rubio (IREC)
- 10:10 h "The power of interdisciplinarity to unlock solutions for future sustainability and well-being"**
Maria Luisa Lima (ISCTE-IUL)
- 10:40 h Coffee break**
- 11:10 h Round table**
- 11:50 h Defence of oral contributions "Draw the future from your research"**
"Participatory Scenario Planning for Transforming Urban Food Systems". Herrero, Amaranta; Moragues-Faus, Ana
"Large-Scale Evidence on Who Benefits from Off-grid Energy". Ntsiful, Enoch; Cohen, Francois
"Participatory educational itineraries as a training proposal for imagining and building sustainable futures in initial teacher education. A GreenComp-informed diagnostic and pedagogical intervention". Arévalo-Rauschenbach, Beatriz; Vancea, Mihaela
"Integrated Assessment of Environmental and Social Sustainability for Industrial Heat Decarbonization in the Mediterranean". Vielma, Carlos A.; Fernández, Ana Inés
"New findings on the links between climate, soil natural capital and multifunctionality for sustainable and resilient agroecosystems". Lladó, Salvador
"Private law tools for the Renovation Wave" - Garcia-Micó, Tomàs Gabriel; Anderson, Miriam
- 13:30 h Lunch break**
- 15:00 h Group Work Session (I) Living in a Sustainable Society**
- 16:30 h Group Work Session (II) Living in a Sustainable Society**

Abstracts

Towards post-growth policymaking: Barriers and enablers for government-led sustainability initiatives

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Providing wellbeing for all while staying within planetary boundaries may require moving towards post-growth societies in which the provisioning of human wellbeing and the safeguarding of ecological outcomes are prioritized over economic growth.

We use “post-growth approaches” as an umbrella term to describe different perspectives aiming to foster transformations towards post-growth societies. They all have in common a critique of GDP as a measure of progress, and an emphasis on sustainability, equity, and human wellbeing. Post-growth approaches include degrowth, Doughnut economics, and post-growth-aligned wellbeing economy perspectives.¹

Various actors and strategies of transformations could contribute to transforming current economic systems towards post-growth. Among them, established political institutions of the state could act to transform the current system from within. Several scholars suggest that post-growth-aligned policy decisions must form part of and can foster wider transformations towards post-growth societies, together with strategies pursued by civil society actors outside of established political institutions.²

However, so far, government-led post-growth initiatives remain restricted to weak post-growth positions.³ To pave the way for a wider political adoption of post-growth approaches we ask the question: What are the most important enablers of and barriers for government-led post-growth initiatives?

To help answer this question and identify priorities for future actions, we examine wellbeing economy and Doughnut economics government initiatives across governance scales in Europe, New Zealand, and Canada. To identify political dimensions of barriers and enablers as well as priorities for future action, we apply a framework that distinguishes between polity, politics, policy, and external factors to analyze the data.

We find that the main barriers are polity-related contextual factors while the main enablers of existing initiatives are the political agency of key individuals and high-level political support. Despite the focus in the post-growth literature on policies, our results suggest that they have limited transformative potential in the current system. The overarching economic growth paradigm severely limits the initiatives' scope of action. Practitioners who promote growth-critical perspectives often face tensions: they need to appeal to broad stakeholder groups while avoiding cooptation. Overall, our findings suggest that further structural changes and a closer engagement with and pressure from civil society are required to support post-growth government initiatives.

These insights are a valuable contribution to the overarching challenge of governance of sustainability transformations in political institutions.

Keywords: post-growth, transformations, government, wellbeing economy, doughnut economics.

1. Kallis, G., Hickel, J., O'Neill, D. W., Jackson, T., Victor, P. A., Raworth, K., Schor, J. B., Steinberger, J. K., & Ürge-Vorsatz, D. (2025). Post-growth: The science of wellbeing within planetary boundaries. *The Lancet Planetary Health*, 9(1), e62–e78. [https://doi.org/10.1016/S2542-5196\(24\)00310-3](https://doi.org/10.1016/S2542-5196(24)00310-3).

2. Koch, M. (2022). State-civil society relations in Gramsci, Poulantzas and Bourdieu: Strategic implications for the degrowth movement. *Ecological Economics*, 193, 107275. <https://doi.org/10.1016/j.ecolecon.2021.107275>.

3. Mason, N., & Büchs, M. (2023). Barriers to adopting wellbeing-economy narratives: Comparing the Wellbeing Economy Alliance and Wellbeing Economy Governments. *Sustainability: Science, Practice and Policy*, 19(1), 2222624. <https://doi.org/10.1080/15487733.2023.2222624>.

Participatory educational itineraries as a training proposal for imagining and building sustainable futures in initial teacher education. A GreenComp-informed diagnostic and pedagogical intervention

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In the context of accelerating socio-environmental crises and the urgent need to imagine and enact sustainable futures, initial teacher education emerges as a key leverage point for social transformation. Education for Sustainability (EfS), as framed within the 2030 Agenda, requires pedagogical approaches that go beyond awareness-raising to foster anticipation, systemic understanding, collective action, and care-oriented values among future educators.

This paper centres on the design and educational potential of Participatory Educational Itineraries (Velasco-Martínez et al., 2025)³ for the Assessment of Habitability, Sustainability, and Environmental Health, conceived as a concrete pedagogical pathway for strengthening EfS in initial teacher education for Early Childhood and Primary Education. These itineraries are designed as place-based, participatory, and developmentally appropriate learning sequences that connect academic knowledge with learners' everyday environments and lived experiences. They aim to support future teachers in engaging learners with local socio-ecological realities while fostering futures-oriented and transformative competencies.

The proposed itineraries were developed in response to a qualitative documentary study analysing the integration of EfS within initial teacher education programmes in public universities in Catalonia. As a diagnostic phase, 646 course syllabi from the 2024/2025 academic year were examined using the European GreenComp framework (Bianchi et al., 2022)² to assess the presence of key sustainability competencies. The analysis revealed that sustainability-related content appears in less than half of the syllabi (45.36%) and is generally fragmented and weakly articulated. Competencies linked to individual responsibility predominate, while those essential for imagining and co-constructing sustainable futures, such as collective action, critical-transformative thinking, anticipation, and systems thinking, remain marginal (Arévalo-Rauschenbach et al., 2025)¹.

These findings highlight a significant gap in current curricula and reinforce the need for pedagogical approaches that intentionally cultivate future-oriented and collective sustainability competencies. The Participatory Educational Itineraries respond directly to this gap. In Early Childhood Education, they prioritise sensory exploration, emotional connection to place, well-being, and care-based values. In Primary Education, they foster inquiry-based learning, accessible systems thinking, collective reflection, and the formulation of context-sensitive proposals for improving sustainability and environmental health. As such, the itineraries offer an actionable and scalable contribution to reorienting initial teacher education toward more integrated, transformative, and future-oriented EfS practices.

Keywords: education for sustainability, sustainability competencies, initial teacher education, change agent, higher education.

1. Arévalo-Rauschenbach, Banqué-Martínez, Neus y Grimalt-Álvaro, Carme (2025). Educación inicial en la formación de maestros/as de Cataluña. (Artículo en revisión).

2. Bianchi, G., Pisiotis, U., y Cabrera Giraldez, M. (2022). GreenComp: El marco europeo de competencias sobre sostenibilidad (M. Bacigalupo & Y. Punie, Eds.; EUR 30955 ES). Oficina de Publicaciones de la Unión Europea. <https://doi.org/10.2760/094757>

3. Velasco-Martínez, L. C., Martín-Jaime, J. J., y Tójar-Hurtado, J. C. (2025). Desarrollar competencias para la evaluación participativa de la sostenibilidad y la emergencia climática mediante el diseño de itinerarios educativos [Development of competencies for participatory evaluation of sustainability and climate emergencies through the design of educational pathways]. *Revista Española de Pedagogía*, 83(290), 63-82. <https://doi.org/10.22550/2174-0909.4132>

Three Proposals for European Private Contract Law Aimed at *Effective Sustainability*

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This paper aims to describe three scenarios in European contract law inspired by the concept of sustainability, specifically that of effective sustainability. This effectiveness suggests proposing three reforms to that legal framework; in particular, and at the very least, it concerns three European directives currently in force, namely:

-Directive 2011/83 (UE), of the European Parliament and of the Council, of 10 October, on consumer rights. Following on from Directive 97/7 on distance contracts, Directive 2011/83 provides the right of consumers entering into distance contracts to withdraw from the contract without penalty and without having to provide any reason (*ad nutum*). The rationale is just that the consumer has not been able to see the product before concluding the contract. The reason, by this author, is insufficient to allow free withdrawal given that the consumer freely decides to contract without first seeing the product. Of course, if the good delivered is not conform with the contract (for example, if it do not work, if it is not of the description, type, quantity, quality...required by the sale contract) consumer has remedies for lack of conformity in the same way as consumer who contract in a business premises. Moreover, withdrawal not only entails the need to return the product (with the associated transport costs), but also renders the goods delivered as used goods. From this perspective, the right of withdrawal appears to be an unnecessary legal measure that tends only to promote a particular model of product marketing, by undermining sustainability. *A reform is suggested whereby this right would not be granted to consumers entering into distance contracts.*

- Directive 2014/1799 (UE), of the European Parliament and of the Council, of 13 June, on the repair of goods amends Directive 2019/771(UE), of the European Parliament and of the Council, of 20 May, on certain aspects of contracts for the sale of goods. Specifically, it requires national legislators to extend the seller's liability period by one year if the consumer, in the event of a lack of conformity, opts for repair (rather than replacement or, where applicable, a price reduction or termination of the contract). However, this extension is of little benefit to the consumer as it does not extend the presumption of non-conformity to the time of delivery of the goods; consequently, the difficulties in proving that the product was delivered with a latent lack of conformity discourage repair, and the new regulation is ineffective in this regard. Sustainability suffers as a result. *It is also proposed to extend the presumption under Article 11 of Directive 2019/771 so that it applies throughout the entire liability period (initial and extended).*

- Directive 2019/771(UE) (see above), expressly includes the durability of goods as a requirement for conformity, and the Directive 2014/1799 suggests incorporating the requirement of reparability into national law. *It is also proposed to include the requirement of sustainability of goods (which should be defined) so that, in the event of the sale of non-sustainable goods, the buyer could also claim liability from the seller for lack of conformity. In this way, the risk of non-compliance would put pressure on the trader to comply and, therefore, to trade under sustainable conditions.*

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Keywords: contract law, conformity requirement, withdrawal, repair.

REGENET: Enhancing Urban Water Sustainability through Laundry Greywater Regeneration and Reuse

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Urban water scarcity increasingly demands practical and scalable solutions to reduce potable water consumption. Self-service laundries are a fast-growing urban service with high water demand, typically consuming 40–90 L per washing cycle. However, greywater from washing machines is usually excluded from reuse strategies due to its complex composition, including detergents, organic matter, pathogens, dyes, and microplastics [1]. The REGENET project aimed to demonstrate that this water stream can be effectively treated and reused under real operating conditions, achieving substantial potable water savings while ensuring user safety and washing performance.

A compact and modular treatment system was developed, combining three mature technologies: particle removal by glass filtration and micro/ultrafiltration (0.14–0.20 μm), disinfection and oxidation by ozonation, and polishing of dissolved organic matter through adsorption on activated biocarbon. The system was designed to be robust, low-maintenance, and suitable for decentralized implementation. Experimental validation was carried out using both real laundry greywater and standardized washing conditions, assessing the influence of relevant operational variables such as detergent type, washing temperature (20–60 $^{\circ}\text{C}$), hydraulic conditions, and consecutive reuse cycles.

The influent showed high contamination levels, with turbidity values up to 590 NTU, chemical oxygen demand (COD) up to 3000 mg L^{-1} , total organic carbon (TOC) up to 700 mg L^{-1} , and *E. coli* concentrations exceeding 10^7 CFU/100 mL, frequently corresponding to the upper range reported in the literature. The filtration and membrane stages achieved removals above 97% for turbidity and suspended solids, while ozonation ensured complete inactivation of the monitored pathogens, consistently reaching concentrations below detection limits. The combined oxidation and adsorption stages resulted in overall organic matter reductions exceeding 90%.

The treated effluent consistently complied with the most restrictive Spanish water reuse standards for urban applications [2]. The system was successfully operated over three consecutive washing cycles using 50% regenerated water, clearly demonstrating a 50% reduction in potable water consumption without compromising water quality or washing efficiency. No significant differences were observed when varying detergent formulations or washing temperatures, confirming the operational robustness of the technology. Preliminary life cycle assessment indicated a marked decrease in freshwater consumption, while highlighting energy use as the main optimization factor for future full-scale implementation.

Overall, REGENET provides clear experimental evidence that laundry greywater can be safely regenerated and reused, effectively reducing potable water demand in urban environments. Owing to its compact design, modular architecture, and reliance on mature technologies, the solution is readily transferable to other water-intensive sectors such as hotels, tourist accommodations, hospitals, and residential facilities, supporting the mitigation of anthropogenic pressure on water resources and the development of more sustainable and resilient urban water management scenarios.

This work was funded by BIT Habitat and the Barcelona City Council (Ajuntament de Barcelona) within the “Convocatòria d’ajuts a la innovació urbana “La ciutat proactiva” 2024 de la Fundació BIT Habitat”.

Keywords: laundry wastewater treatment, water reuse, ozonation, filtration, urban water sustainability.

1. Rodrigues, K. C., de Morais, L. S. R., & de Paula, H. M. (2022). “Green and sustainable treatment of washing machine greywater for reuse in the built environment”. *Cleaner Engineering and Technology*, 6, 100410. <https://doi.org/10.1016/j.clet.2022.100410>.

2. Spanish Government. (2024). *Royal Decree 1085/2024 on water reuse*. Boletín Oficial del Estado (BOE), Spain.

Vulnerable groups and the digitalization of judicial proceedings: toward sustainable justice.

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The COVID-19 pandemic accelerated the process of digitalization across a range of sectors of society, including the Administration of Justice.

With the aim of bringing justice closer to citizens and improving the quality of the public service provided, the legislature enacted a range of legislation on the use of information and communication technologies in the Administration of Justice. This body of rules has become an instrument to promote and facilitate the remote participation of citizens in judicial proceedings. This represents a further step toward digitalization in a modern and advanced society, in which the principles of efficiency and effectiveness are brought to bear on the Administration of Justice, allowing it to become more sustainable and to adapt to social change.

The digitalization of justice offers considerable advantages that cannot be overlooked, not only for legal professionals but also for citizens, extending the reach of justice beyond large cities to smaller and more remote towns. All of this contributes to advancing toward a system of justice in which equality is the defining feature.

However, we must bear in mind that we live in a world marked by wide inequalities, which were further exacerbated in the aftermath of the pandemic. For this reason, it is worth drawing attention to the Sustainable Development Goals of the United Nations 2030 Agenda and to the concrete expression they find in the Brasilia Rules on Access to Justice for Persons in a Condition of Vulnerability.

In light of the foregoing, it may be contended that the introduction of new technologies and the digitalization of justice can indeed facilitate access to justice for citizens in a condition of vulnerability. In any event, it may at least be said that, in principle, digitalization enables justice to reach a greater number of citizens, thereby broadening this right of access. Under no circumstances should it operate as a source of exclusion or as a barrier. It should not be forgotten that the complexity of judicial proceedings, and of court settings themselves, already constitute an obstacle for citizens.

This study has been conducted within the framework of the research project entitled: "Violencia Extrema sobre la mujer: respuesta penal y alternativas para la prevención" (2023–2027), funded by the Ministry of Science and Innovation, with reference number PID2022-140170NB-I00; the project "Uso de la inteligencia artificial en el proceso judicial" (2025–2029), funded by the Ministry of Science and Innovation and Universities, with reference number PID2025-169916NB-I00; and the Generalitat de Catalunya research group "Use of AI in the Spanish Administration of Justice".

Keywords: digitalization, sustainable justice, equality, vulnerability, access to justice.

Modeling Arctic Freshwater Dynamics to Inform Global Climate Resilience and Sustainable Future Scenarios

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The Arctic Ocean is currently undergoing a dramatic transformation, warming at nearly four times the global average. This "Arctic Amplification" has direct consequences on the global hydrological cycle, primarily through the unprecedented accumulation and release of freshwater from sea ice melt and river runoff. Understanding these dynamics is not merely a challenge for physical oceanography; it is a fundamental requirement for the creation of sustainable social scenarios. The FRESH-CARE project (ERC Starting Grant led by Dr. Marta Umbert) addresses this challenge by utilizing high-resolution numerical modeling to investigate how freshwater distribution will evolve under different climate pathways.

The research focuses on the mechanisms governing freshwater storage and export from the Arctic basin to the North Atlantic. Using a state-of-the-art ocean model, we simulate future scenarios ranging from optimistic low-emission pathways to high-emission "business-as-usual" trajectories. This model will allow us to quantify the potential freshening of the North Atlantic, a process that threatens to weaken the Atlantic Meridional Overturning Circulation (AMOC). A slowdown of the AMOC would trigger drastic shifts in European weather patterns, affecting sea-level rise, agricultural productivity, and energy demands.

The contribution of this research to the generation of sustainable future scenarios is twofold. First, it provides the physical baseline necessary for climate adaptation and mitigation strategies. Sustainable social design cannot be achieved without a precise understanding of the environmental constraints of the near future. By identifying potential "tipping points" in Arctic freshwater export, our results offer policymakers and stakeholders the data needed to anticipate risks and design resilient infrastructure and socio-economic policies.

Second, the project bridges the gap between complex climate physics and social sustainability. By translating numerical outputs into actionable climate projections, the research empowers societies to transition from reactive crisis management to proactive sustainable planning. In the context of the current climate emergency, the stability of the Arctic is a global common good. Therefore, the FRESH-CARE project serves as an essential tool for the scientific community and society at large to navigate the uncertainties of the 21st century, ensuring that the "sustainable scenarios" we envision are grounded in the most robust physical evidence available.

As part of my postdoctoral research at the Institute of Marine Sciences (ICM-CSIC), this work also emphasizes the importance of open-access data and interdisciplinary collaboration, fostering a more transparent and inclusive scientific dialogue regarding our shared climatic future.

Keywords: oceanography, ocean modelling, Arctic, freshwater, climate change.

Nanotechnology Education for Sustainable Futures: El legado de Nanoinventum, integrating MOOCs and Project-Based Learning through Nanorobot Design

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The transition toward sustainable societies requires not only technological innovation but also new educational frameworks capable of fostering systems thinking, creativity, and scientific rigor. This work presents El legado de Nanoinventum, an educational initiative that integrates a Massive Open Online Course (MOOC) titled Nanotechnology for a Sustainable Future with project-based learning activities in formal education contexts.

The MOOC provides foundational knowledge on nanotechnology, sustainability, and their intersection with global challenges, including energy, health, water, and materials. It is structured around key scientific principles (e.g., size-dependent properties, surface-to-volume ratio, and nanoscale interactions) and connects them to real-world applications aligned with the Sustainable Development Goals (SDGs).

Complementing the MOOC, students engage in the design and construction of nanorobot models aimed at solving sustainability-related problems. These projects are evaluated not solely on technical accuracy but on coherence, functionality, scientific reasoning, and communication. This approach enables learners to “make tangible the intangible,” bridging abstract nanoscale concepts with societal challenges.

Preliminary results from implementation in schools indicate increased student engagement, improved understanding of nanoscale concepts, and enhanced ability to connect science with sustainability issues. Teachers report high adaptability of the resources and strong integration into interdisciplinary curricula.

This research contributes to the creation of sustainable social scenarios in three key dimensions:

- **Education for Sustainability (E4S):** It equips students with scientific literacy and critical thinking skills necessary to understand and address complex sustainability challenges.
- **Innovation Culture:** By designing nanorobot-based solutions, students develop creative problem-solving skills aligned with emerging technological paradigms.
- **Scalable Impact:** The MOOC format ensures accessibility and replicability, enabling widespread dissemination across educational systems.

By linking nanoscale science with macro-scale societal challenges, this approach fosters a new generation of citizens capable of envisioning and co-creating sustainable futures

Keywords: nanotechnology, nanoinventum, education, MOOC.

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Sustainable nitrate remediation techniques within a circular economy framework

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Nitrate is a common pollutant originating from the extensive use of fertilizers in agricultural areas. Its presence in water resources poses a public health concern, as ingestion of nitrate-contaminated water has been associated with methemoglobinemia and an increased risk of colorectal cancer. In addition, it also threatens aquatic ecosystems by promoting eutrophication processes. Regulatory measures aimed at limiting fertilizer application have been implemented since the 1990s. However, nitrate pollution remains widespread, and many water bodies still exceed established regulatory thresholds, which in Spain are set at 37.5 mg/l for groundwater and 25 mg/l for surface waters (RD 47/2022), making nitrate a persistent socio-environmental and socio-economic challenge.

This contribution investigates nature-based strategies to mitigate nitrate pollution by enhancing microbial denitrification, a natural process that transforms nitrate into inert nitrogen gas when an electron donor, such as organic carbon, is available. Denitrification in waterbodies is often limited by organic carbon scarcity. As a result, a potential remediation strategy is the injection of pure organic carbon-rich compounds into nitrate-polluted water bodies. However, the use of pure compounds is costly and might involve production-related constraints that may limit their sustainability at large scales, highlighting the need for cost-effective alternatives such as agro-industrial by-products, in line with circular-economy principles. In this context, we evaluated the use of whey, a dairy by-product, as an external electron donor to stimulate denitrification in different polluted water bodies. The study followed an integrated approach combining laboratory experiments, pilot-scale field applications, and stable isotope analyses ($\delta^{15}\text{N}$ and $\delta^{18}\text{O}\text{-NO}_3$).

The laboratory experiments proved the feasibility of whey as an electron donor for denitrification. Also, nitrogen and oxygen isotope fractionation values in nitrate ($\epsilon^{15}\text{N}$ and $\epsilon^{18}\text{O}$) were determined and used as a process-based validation tool beyond concentration-based assessments, as denitrification produces a distinctive isotopic fingerprint.

Pilot-scale field applications were then conducted in two complementary systems affected by agricultural nitrate pollution: a constructed wetland treating agricultural runoff in Ejea de los Caballeros (Zaragoza), and the Quaternary Campo de Cartagena aquifer that discharges into the Mar Menor coastal lagoon. In both sites, nitrate concentrations exceeding 200 mg/L have been measured. The results demonstrated that whey-based biostimulation can substantially reduce nitrate concentrations under regulatory thresholds when dosing and hydraulic conditions are appropriately managed in both systems. Isotopic analyses proved essential for quantifying the efficiency of the remediation strategy at field-scale.

Beyond technical performance, this strategy contributes to the creation of sustainable socio-environmental scenarios by promoting circular reuse of agro-industrial residues and reducing remediation costs in nitrate mitigation measures. The integration of nature-based solutions with isotopic evidence provides a transferable framework to support sustainable water remediation in agricultural landscapes facing chronic nitrate pollution.

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Keywords: nitrate, remediation, agricultural runoff, denitrification, isotopes.

Towards sustainable veterinary surveillance: environmental monitoring of bluetongue virus in farms and slaughterhouses

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Bluetongue virus (BTV) is a vector-borne pathogen of major veterinary concern, causing significant economic losses in livestock and increasingly influenced by climate-driven shifts in vector distribution. Conventional surveillance strategies rely primarily on clinical diagnosis and individual animal testing, which are invasive, resource-intensive, and often fail to detect early or subclinical circulation¹. This study evaluates the potential of environmental surveillance as a complementary, non-invasive approach for monitoring BTV circulation through the analysis of aggregated samples collected at farm and slaughterhouse levels during an outbreak in Catalonia.

Environmental matrices, including drinking water, straw bedding, manure, and surface swabs, were collected from BTV-confirmed farms, alongside wastewater samples from two slaughterhouses using both grab sampling and passive sampling (PS). Molecular detection was performed using nested RT-PCR and RT-qPCR assays, and retrospective analyses were conducted on archived wastewater samples. BTV RNA was consistently detected across multiple environmental matrices despite low proportions of clinically confirmed infected animals, with drinking water and straw bedding showing the highest sensitivity. In slaughterhouse wastewater, PS significantly outperformed grab sampling, demonstrating higher detection rates and greater temporal consistency.

Notably, retrospective wastewater analysis revealed the presence of BTV RNA weeks to months prior to official outbreak notifications, indicating silent or underreported viral circulation. These findings highlight the capacity of aggregated environmental surveillance to act as an early warning system, providing epidemiological insights at both local and regional scales. Furthermore, slaughterhouse wastewater surveillance enabled the indirect tracing of viral circulation based on the geographical origin of animals, supporting targeted intervention strategies.

This research contributes to the generation of sustainable future scenarios by proposing a surveillance framework that is non-invasive, cost-effective, and scalable. By reducing the need for extensive animal handling and enabling early detection of outbreaks, environmental monitoring supports more efficient resource allocation, minimizes economic losses, and enhances animal welfare. Additionally, integrating such approaches within a One Health framework strengthens preparedness against emerging and climate-sensitive diseases, promoting resilient livestock systems and sustainable agricultural practices.

Overall, this study provides proof of concept that environmental surveillance, particularly when incorporating passive sampling, can significantly enhance current veterinary monitoring systems. Its implementation could improve early warning capabilities, support data-driven decision-making, and contribute to more sustainable and adaptive responses to infectious disease threats in a changing global context.

Keywords: Bluetongue virus (BTV), passive sampling, slaughterhouse wastewater, aggregated environmental samples, veterinary surveillance.

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Necessary Cost or Irresponsible Excess? Public Legitimacy of Energy-Intensive AI Development and Sustainable Futures in Cross-Platform Discourse

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Sustainable futures require technological progress, but progress generates new demands for energy, resources, and public justification. This tension raises a foundational social question: under what conditions do publics accept the resource costs of new technologies as legitimate rather than excessive? Drawing on theories of technological legitimacy and moral reasoning, this study treats online discourse about AI energy use not as simple opinion, but as a site of public judgment about whether AI-driven progress warrants social support under sustainability constraints.

We manually collected public posts, answers, and comments addressing AI energy use, data-centre electricity demand, and the environmental costs of AI from Reddit and Zhihu. Parallel English and Chinese keyword searches were conducted, including "AI energy consumption," "ChatGPT energy use," "data-centre electricity demand," and "AI data centres," yielding a final corpus of 287 valid Reddit entries and 135 valid Zhihu entries. Reddit was selected as an English-language community-based discussion platform; Zhihu was selected as a Chinese-language question-and-answer platform in which extended reasoning and elaborated justification are normative features of user contribution. Both platforms thus afford comparisons of public reasoning and justification, not merely brief affective reactions. Thematic analysis following Braun and Clarke's reflexive framework was applied, with cross-platform comparison used to identify both shared and platform-specific patterns in how users negotiate the tension between innovation and sustainability.

The analysis reveals divergent public reasoning across the two platforms, reflecting broader cultural and institutional differences. On Zhihu, AI energy use is predominantly framed through developmental and techno-governance logics: as a necessary cost of national progress, an infrastructure planning challenge, or a solvable problem through green computing. On Reddit, the same issue is more morally and politically contested: users link AI energy consumption to individual guilt, distrust of Big Tech, local infrastructure inequity, demands for corporate data transparency, and concerns about who bears costs and who captures benefits. Across both platforms, however, energy use is rarely debated as a technical fact alone. Instead, it serves as a vehicle through which users evaluate whether AI-driven progress is necessary, fairly governed, and socially legitimate, suggesting that public ambivalence about AI energy is better understood as a form of moral and governance reasoning than as a simple attitude toward technology.

This study contributes to research on sustainability communication, cross-cultural public reasoning, and the governance of emerging technologies. Theoretically, it reframes AI energy use, an issue of growing material urgency, as a case of public legitimacy judgment rather than attitudinal measurement, shifting the analytical question from how much energy AI uses to under what conditions publics grant or withhold social support for energy-intensive innovation. Empirically, the cross-platform comparison reveals that legitimacy judgments are structured around four linked conditions: perceived necessity, distributive fairness, institutional trust, and governance credibility. When these conditions are met, energy-intensive technological progress may be accepted as manageable and socially warranted; when they are absent, the same innovation risks being interpreted as irresponsible excess or corporate externalisation. These findings offer actionable implications for science communication and public legitimization of sustainable innovation.

Keywords: technological legitimacy, moral reasoning, AI energy consumption, sustainability communication.

Private law tools for the Renovation Wave

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Private law is expected to play a significant role in achieving net-zero goals. One of the areas where the law governing relationships between private individuals can and must endeavour to develop tools to promote the transition concerns the renovation of the building stock. Although traditionally regulated by public law, the EU Green Deal also needs to be implemented through contract law, property rights and multi-layered legal instruments, including those for energy supply.

Our research focuses on the adjustments required for traditional private law to adequately serve this purpose. The balance between the parties must be reshaped in light of common goals, to which public funding should contribute, though it cannot be expected to carry the entire weight of the transition. As stated in different EU provisions and packages, legal barriers must be removed, and changes in the law could lead to overcoming certain economic barriers.

In light of the pressing need to transpose Directive (EU) 2024/1275 on the energy performance of buildings, our study focuses on the two main private law approaches to ownership and economic risk regarding new installations and renovations in general. It seeks to promote clarity and thus legal certainty at the intersection of property rights and contract law, including the law of insolvency and insurance.

Regarding ownership approaches, the Spanish perspective—where the owner of the property (or the community of owners in multi-unit buildings) acquires the energy efficiency installation (for instance, solar panels, or aerothermal or geothermal systems)—requires significant upfront investment and the assumption of risk that the energy renovation might not be as efficient as expected. In view of this, legal reforms aimed at facilitating energy-efficiency-related agreements in multi-unit buildings have been implemented in Spain.

However, in other systems owners are not expected to purchase the new installations and undertake the related risk, because the energy efficiency solution provider retains title and may or may not guarantee the expected energy cost savings. From a private law perspective, this requires adjusting the regulation of multi-unit buildings to include such arrangements and tailoring existing rules on accession, property rights and personal rights over another's property. Whether one approach or the other is favoured, promoting the uptake of green loans and exploring ways to overcome the landlord-tenant split incentive are necessary.

Moreover, as suggested by the EU in different pieces of legislation, long-term contracts are set to play a significant role in the energy transition of the building stock, given that, realistically, most retrofits will have to be carried out in stages, perhaps with the guidance of a renovation passport. Such contracts will often combine installation, maintenance and the provision of energy, and may involve different title holders in multi-unit buildings or housing estates.

To a large extent, the success of the energy transition depends on a private law framework that allows the EU Green Deal to cross the threshold of the domestic sphere, transforming the home into a sustainable haven through win-win scenarios that align everyday life with our collective climate goals.

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Keywords: renovation wave, housing, private law, sustainability, green energy

Citizenship as a driver of social sustainability: transforming mental health through participation and technological innovation

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Social sustainability is increasingly recognised as a key determinant of mental health. The COVID-19 pandemic exposed the limits of the traditional biomedical model and accelerated the need for a new paradigm, one that goes beyond symptom reduction to address the social and structural conditions that enable people to live full and meaningful lives. This communication will present the Citizenship framework¹ as a conceptual response to this challenge. Citizenship in mental health is defined as the degree to which a person can exercise connection across five dimensions, known as the '5Rs': Rights, Responsibilities, Roles, Resources, and Relationships². A sustainable society is only possible when all its members, including those living with mental health challenges, are able to participate fully in it by exercising their rights, assuming their responsibilities and developing new roles in society, while being able to relate and manage resources by themselves³. We report findings from two citizenship-based research projects conducted at the University of Barcelona.

The first, 'Citizenship as Mental Health', used participatory action research and concept mapping methods to co-validate a citizenship measure with service users, relatives and mental health professionals. A randomised controlled trial was then conducted to evaluate whether awareness-raising interventions can shift paternalistic and stigmatising attitudes among mental health professionals towards rights-based approaches⁴. Results indicate that targeted interventions are effective in producing meaningful attitudinal change, a prerequisite for inclusive services.

The second project, 'Live Citizenship' shifts the focus directly to people with lived experience of mental health challenges. Through co-design workshops grounded in citizen science principles, service users act as experts in their own recovery. The central innovation of this phase is the development of an AI-powered Reflective Recovery Trajectories Tool, which uses personal life narratives to provide tailored support and foster autonomy⁵.

Both projects integrate a gender perspective, acknowledging the compounded vulnerability experienced by women within mental health systems. The Citizenship model contributes directly to Sustainable Development Goals 3, 10 and 16 by promoting health and well-being, reducing inequalities, and building more inclusive institutions. From an economic standpoint, supporting people's return to social and occupational roles mitigates the substantial indirect costs associated with long-term social exclusion. In conclusion, the Citizenship framework repositions recovery not as a clinical outcome but as a civic right, and demonstrates that participatory research can work to advance a more equitable and sustainable society⁶.

Keywords: citizenship, mental health, participatory action research, sustainability

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Participatory Scenario Planning for Transforming Urban Food Systems

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Urban food systems are at the centre of pressing environmental and social challenges, including climate change, resource depletion, and growing inequalities. Cities, as key sites of consumption, governance, and innovation, play a critical role in advancing transformations toward more sustainable and just food systems. However, these transformations unfold under conditions of uncertainty, complexity, and competing priorities, calling for approaches that can support anticipatory, inclusive, and forward-looking decision-making.

This presentation examines the use of participatory scenario planning as a methodological approach to advance sustainable urban food systems, with a particular focus on food sharing initiatives. These initiatives encompass collaborative activities carried out by formal or informal organisations to grow, cook, distribute, and consume food, as well as to share related skills, knowledge, spaces, and tools¹. By integrating futures thinking with participatory processes, the approach enables diverse actors within urban food sharing systems to collaboratively explore alternative futures and co-design strategies for systemic change.

The research is based on the development and implementation of a scenario planning methodology tested through participatory workshops in three European cities: Barcelona, Milan, and Utrecht. The methodology combines visioning, backcasting, and scenario stress-testing to support the co-creation of future scenarios and the identification of resilient transition pathways in food sharing arenas. By bringing together actors from the public, civil society, and private sectors engaged in food sharing and urban food systems, the process fosters dialogue across perspectives, surfaces tensions and trade-offs, and strengthens collective capacity to navigate uncertainty.

The contribution of this research to the creation and design of sustainable future scenarios is threefold. First, it demonstrates how participatory scenario planning can broaden the range of imagined futures by incorporating diverse perspectives, including those often marginalized in conventional planning processes. Second, it shows how combining normative (visioning and backcasting) and exploratory (scenario development and stress-testing) approaches enhances the robustness and relevance of future scenarios, enabling them to better account for uncertainty and complexity. Third, it highlights the importance of treating scenario planning as a situated and reflexive practice that can influence governance dynamics, support cross-sectoral collaboration, and align long-term visions with actionable strategies.

The findings suggest that participatory scenario planning can play a key role in advancing sustainability transitions in urban food systems by fostering systemic thinking, enabling more inclusive forms of governance, and supporting adaptive and forward-looking decision-making. At the same time, the research underscores that its effectiveness depends on careful design, meaningful inclusion, and integration into formal decision-making processes.

Overall, this work contributes to ongoing debates on sustainable futures by demonstrating how participatory foresight approaches can support the co-creation of more resilient, equitable, and sustainable urban food systems.

Keywords: urban food systems, urban food governance, futures thinking, participatory foresight, food sharing

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Bioherbicides and Allelopathy in Rice: New Approaches to Sustainable Weed Control

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Weed control in rice cultivation remains a major constraint in the transition towards sustainable agri-food systems. The widespread use of chemical herbicides is associated with significant environmental impacts and risks to human health, including soil and water contamination and exposure to potentially hazardous compounds¹. Within the planetary health framework, there is an urgent need for alternative strategies that reduce these impacts while ensuring resilient and safe food production.

This study explores the potential of allelopathy as an ecological approach to weed management in rice. We hypothesise that the application of rice bran as a bioherbicide, combined with the selection of highly allelopathic rice varieties, can reduce or replace synthetic herbicides^{2,3}. Although numerous allelopathic compounds have been identified in rice, their functional roles, regulatory mechanisms and agronomic relevance -under European conditions- remain poorly understood.

To address this gap, an integrated experimental framework that combines in vitro bioassays, greenhouse experiments and field trials in the Ebro Delta. Initial work has focused on germination and growth assays using major weed species, alongside the optimisation of experimental protocols and the selection of representative rice varieties. In parallel, analytical methods are being developed to characterise allelopathic compounds in root exudates using high-performance liquid chromatography (HPLC).

The efficacy of rice bran as a bioherbicide is being evaluated in comparison with commercial products, considering both weed suppression and potential fertilising effects. Field trials have been implemented to evaluate these strategies under real agronomic conditions, including soil physicochemical characterisation and monitoring of weed community dynamics³.

In addition, a molecular approach is being developed to identify genes and metabolic pathways involved in the biosynthesis of allelopathic compounds. This will enable the linkage of gene expression patterns with observed phenotypic responses and support the development of rice varieties with enhanced competitive ability⁴.

Overall, this research aims to reduce pesticide inputs, improving agroecosystem sustainability and advancing environmentally sound weed management strategies. These findings will provide a robust scientific basis for the development of sustainable rice production systems aligned with planetary health and global food security objectives.

Keywords: *oryza sativa*, allelopathy, bioherbicides, sustainable agriculture, weed management.

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Climate Change – “The Measure of All Things”: The Missing Map of Climate Narratives

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This study undertakes a historically grounded analysis that traces the evolution of climate change narratives from the late 1960s to the present. It develops a comprehensive interpretive framework by situating these narratives within a newly constructed “map of climate narratives,” introduced here for the first time. This analytical map not only accounts for the interaction between historical contingencies and technological transformations, but also foregrounds the increasingly complex positioning of narratives within a global epistemic and political space. Building on three foundational dimensions of narrative analysis—temporality, sociability, and spatiality—the study advances a structured triangulation of climate narratives since 1960. Within this framework, three persistent and analytically significant shortcomings are identified, each of which continues to shape and limit the existing scholarly literature.

First, climate narratives exhibit intrinsic epistemological and theoretical constraints insofar as they are produced and developed within specific conceptual boundaries. These boundaries shape not only what is made visible within each narrative, but also what is systematically excluded from it. As a result, narratives tend to operate in relative isolation, with limited engagement across alternative interpretive frameworks. This fragmentation is reinforced by the persistence of disciplinary silos and the dominance of particular epistemic traditions, which hinder meaningful dialogue between competing or complementary perspectives. Moreover, the marginal incorporation of insights originating outside Western geographies further narrows the scope of analysis, reducing the capacity of climate discourse to reflect the plurality of global experiences and knowledge systems.

Second, climate narratives should be understood as interdependent and historically cumulative rather than discrete or self-contained. They evolve through processes of continuity, transformation, and selective appropriation, whereby earlier narrative forms are reconfigured into new conceptual arrangements. This dynamic can be observed, for example, in the transition from ecological modernization to sustainable development, where core assumptions are retained while normative and institutional dimensions are expanded and rearticulated. The incorporation of sustainable development principles into major policy frameworks, including the Kyoto Protocol, illustrates how narratives can acquire institutional traction and generate self-reinforcing feedback loops. Such processes reveal the inherently recursive nature of climate narrative, in which narrative evolution is consistent with the proposed triadic structure of temporality, sociability, and spatiality.

Third, contemporary climate narratives remain insufficiently inclusive of non-Western perspectives, thereby reproducing significant epistemic and representational asymmetries. This limitation manifests in the underrepresentation of diverse cultural frameworks, governance traditions, and socio-environmental experiences that are critical to understanding climate change as a truly global phenomenon. In many cases, dominant narratives privilege Western scientific and policy paradigms, while alternative ontologies and locally grounded forms of environmental knowledge are either marginalized or treated as supplementary. This imbalance not only restricts analytical comprehensiveness but also constrains the formulation of equitable and context-sensitive responses to climate change. Addressing this gap requires a deliberate expansion of the narrative field to incorporate plural epistemologies and to better account for the differentiated ways in which climate change is experienced, interpreted, and acted upon across regions.

Keywords: climate change, climate narratives, degrowth, green economy, green growth, sustainable development.

New findings on the links between climate, soil natural capital and multifunctionality for sustainable and resilient agroecosystems

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Soils underpin the functioning and resilience of agroecosystems, yet they are increasingly degraded by multiple, interacting anthropogenic pressures. Climate change alters temperature and precipitation regimes, intensifying droughts and extreme events, while unsustainable land-use practices—such as intensive tillage, chemical inputs, and monocropping—accelerate soil degradation and biodiversity loss. These pressures disrupt soil structure, reduce organic matter, and erode the diversity of soil organisms that regulate key ecosystem processes. As a result, agroecosystems are becoming more vulnerable to environmental stressors, threatening their capacity to sustain productivity and deliver essential ecosystem services.

Despite growing recognition of these challenges, critical knowledge gaps remain in relation to our ability to design sustainable futures for agroecosystems. In particular, the role of the natural capital of soils (including soil biodiversity) in mediating key ecosystems services and increase resilience under changing climate and management conditions is still insufficiently understood. While sustainable practices such as organic management are often proposed as solutions, their effectiveness appears to be highly context-dependent, varying with climatic conditions, types of soil and, for example, the degree of soil degradation. This means that a conceptual and analytical framework, with qualitative and quantitative indicators, was required to produce the evidence to account for the complex interactions, synergies, and trade-offs, between climate drivers and management interventions with the natural capital of soils and the plural value of the ecosystem services that soils deliver. Only the obtention of harmonized data, at relevant multiple scales, through this type of frameworks, would increase our potential to predict outcomes and design robust interventions for sustainable and resilient futures.

Through the design and implementation of the soil biodiversity and well-being framework^{1,2,3}, our work advances a more integrated understanding of how environmental variables, soil natural capital (e.g., soil carbon and soil biodiversity) and management practices (e.g., conventional and organic agriculture) interact to influence agroecosystem resilience. First, we implemented the framework across agricultural sites located in specific geographical regions across four continents and identified the primary environmental community composition drivers and assessed the effects of the transition from conventional to organic management (no chemical inputs) on soil ecology. The results demonstrate the importance of a regional-specific context for a future generalized transition towards organic soil management. Specifically, under the most arid conditions in our study (Mediterranean areas), organic management showed potential to buffer biodiversity loss in highly degraded soils, compared to conventionally managed soils². In addition, our results also showed that high crop yields did not necessarily trade off against soil biodiversity and ecosystem multifunctionality, with often positive correlations found between them. Yield, biodiversity and functioning variables showed a broad range of values within and between conventional and organic sites. Despite this large variation, we found that increasing the regional surface under soil organic management to numbers around 50% has the potential to optimize crop yields, biodiversity and multifunctionality³. Our findings provide guidelines for sustainable agriculture, showing how prioritizing the transition to organic farming in moderately to highly degraded soils would maximize its benefits while minimizing yield loss.

Keywords: agroecosystems, soils, soil biodiversity, multifunctionality, sustainable management practices.

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Designing and Validating an Educational Programme to Foster Transversal Sustainability Competencies in Higher Education

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The transition toward sustainability requires citizens who can act as agents of change, underscoring the need to incorporate educational proposals within higher education that foster the development of competencies enabling students to address contemporary social, economic, and environmental challenges.

In this context, this research aims to design and validate an educational programme for the development of transversal sustainability competencies, based on the creation of entrepreneurial proposals through design thinking and grounded in the principles of the Social and Solidarity Economy. The study is situated within the Faculty of Education at the Universitat de Barcelona.

Methodologically, the research is framed within an interpretive paradigm and a qualitative orientation. Within this framework, Design-Based Research (DBR) is adopted as the ideal method for developing, analyzing, and improving educational interventions in real-world contexts. This approach is implemented through various case studies that constitute the empirical context of the study, specifically courses at the Faculty of Education of the University of Barcelona, where the educational program is applied. This allows for the evaluation of its effectiveness in authentic learning situations and the progressive refinement of its design based on the empirical evidence generated during its implementation.

At the technical level of data collection and analysis, the study incorporates the triangulation of quantitative and qualitative methods to systematize the research process and strengthen the validity of the results.

In line with international frameworks such as UNESCO's Education for Sustainable Development¹ and the European GreenComp framework², the programme promotes key competencies related to systems thinking, anticipation, critical reflection, and collective action. The programme enhances students' capacity to envision fairer and more sustainable futures and to translate sustainability values and principles into concrete proposals for social intervention. In doing so, the study contributes to the development of replicable educational models and reinforces the role of universities as key agents in the transition toward sustainable development.

Keywords: transversal sustainability competencies, higher education, design-based research, design thinking, social and solidarity economy.

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Towards Sustainable Urban Water Management: Stormwater Runoff Treatment for Reuse

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Urban stormwater runoff is an increasingly significant environmental challenge and, at the same time, a largely underutilized alternative water resource, particularly in Mediterranean cities that are progressively affected by water scarcity, climate variability, and urban expansion. The intermittent nature of storm events and the highly variable composition of urban runoff, characterized by elevated turbidity, high concentrations of suspended solids, organic matter, and microbial contamination, pose substantial barriers to its direct reuse¹. Within this framework, and in alignment with the objectives of the PLUVIPA-BCN project, the present research investigates an integrated treatment strategy based on ballasted flocculation followed by disinfection for the treatment and reuse of urban stormwater runoff.

Stormwater runoff samples collected from a retention tank in Barcelona (Spain) were comprehensively characterized, revealing high initial turbidity (850 NTU), total suspended solids (800 mg L⁻¹), and organic load (COD 1650 mg L⁻¹), highlighting the critical need for effective clarification prior to reuse. Ballasted flocculation experiments were conducted using ferric chloride (FeCl₃) as the coagulant and natural magnetite (Fe₃O₄) as the ballasting agent at controlled pH conditions. Process optimization was carried out using a face-centered central composite design, considering coagulant and ballasting agent dosages as independent variables and turbidity removal as the response variable.

The results demonstrated that the incorporation of magnetite significantly enhanced floc density and settling velocity, leading to markedly faster clarification kinetics. Turbidity removals exceeding 95% were achieved within 15 s, and reductions above 97% were obtained after 30 s of settling, whereas conventional flocculation required several minutes to reach comparable efficiencies. Optimal operating conditions were identified at FeCl₃ and magnetite dosages of 0.16 g L⁻¹ and 1.2 g L⁻¹, respectively, achieving residual turbidity values below 5 NTU and meeting the quality requirements established by European Regulation (EU) 2020/741 for several non-potable reuse applications. Following clarification, disinfection performance was evaluated. A chlorine dose of 50 mg L⁻¹ was sufficient to satisfy the chlorine demand of the treated stormwater, ensuring the establishment and maintenance of a stable free chlorine residual. Coliforms and E. coli concentrations were reduced to insignificant levels, confirming effective microbial inactivation.

Moreover, with the aim of fostering circular economy principles, special attention was devoted to the sustainability of magnetite use. Although magnetite proved to be an effective ballasting agent due to its high density and positive impact on floc formation and settling kinetics, large-scale application would require substantial quantities of this material. To address this limitation, the study proposes the recovery and reuse of magnetite as a key strategy to enhance process sustainability. Accordingly, different magnetite regeneration approaches were evaluated, including thermal, chemical, and physical treatments, in order to restore ballast properties and enable its reutilization in assisted flocculation processes.

Overall, this research contributes to the generation of sustainable future scenarios by advancing a high-rate, compact, and energy-efficient treatment solution that supports circular water use, reduces dependence on conventional water resources, and enhances the resilience of urban water systems under increasing climate stress.

Keywords: stormwater reuse, ballasted flocculation, magnetite recovery, urban water management

¹ Sandoval, E. A. C., & Ahammed, F. (2025). Performance Impacts of Rainwater Tanks on Stormwater Drainage Systems. *Hydroecology and Engineering*, 2(1), 10002.

The Third Mission of Universities as Hubs of Social Cohesion in Shaping Sustainable EU–Ukraine Futures

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Russia's full-scale war against Ukraine has triggered profound demographic and social transformations across Europe. As of 2025, more than 34,070 Ukrainian citizens are registered in Catalonia, indicating not temporary mobility but the emergence of longer-term settlement patterns. Broader European studies confirm this trend, showing that a significant share of displaced Ukrainians consider remaining abroad for an extended period. Combined with the expected end of the Temporary Protection regime in 2027, these developments create new challenges for EU integration policies, social cohesion, and engagement with Ukrainian communities abroad.

In this context, universities are gaining renewed importance through the implementation of their «third mission» - social engagement, community interaction, and the facilitation of public dialogue. They increasingly function as local hubs of social cohesion, where perceptions of identity, political processes, and the future of European integration are shaped, including in relation to EU–Ukraine relations.

The research presented focuses on the analysis of universities in Barcelona in order to assess the extent to which academic environments contribute to Ukraine's integration into the European educational and value-based space. A structured review of academic programmes and departments related to Slavic studies was conducted, with particular attention to the presence of Ukrainian-focused components. The findings indicate a limited integration of Ukrainian topics within teaching and research practices, pointing to structural gaps that may hinder a deeper understanding of Ukraine as a prospective EU member.

At the same time, the integration process is inherently two-directional. Alongside the need to strengthen the presence of Ukraine within European academic and public discourse, there is also a growing need to enhance understanding of EU values, policies, and institutional frameworks among Ukrainians, particularly those residing abroad. Ukrainian communities in the EU are increasingly emerging as key actors not only in integration processes but also in the future recovery of Ukraine, facilitating the transfer of knowledge, professional experience, and European standards.

From this perspective, universities can be conceptualised as strategic infrastructures for the development of sustainable future scenarios. By combining education, research, and public engagement, they contribute to more inclusive and resilient models of integration that support both the EU enlargement process and Ukraine's post-war transformation. This approach aligns with the Sustainable Development Goals, particularly SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 16 (Peace, Justice and Strong Institutions).

The results of this research also outline directions for further academic and educational initiatives. In particular, they have served as a foundation for the development of a Jean Monnet Module proposal aimed at strengthening the role of universities as platforms for integration, mutual understanding, and the co-creation of a shared European future.

Keywords: social cohesion, universities' third mission, EU integration, post-war reconstruction.

Large-Scale Evidence on Who Benefits from Off-grid Energy

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Despite near-halving the number of people without electricity access over the past 15 years, substantial energy poverty persists, particularly among the rural households in low- and middle-income countries (LMICs) beyond the reach of centralised grids. Off-grid technologies have emerged as a complementary pathway to expand energy access. Yet rigorous, large-scale comparative evidence on which technologies deliver the greatest user-level gains, which populations benefit most, and how welfare effects are channelled remains critically lacking.

This paper provides the first large-scale comparative assessment of user-reported benefits from off-grid energy deployment. We analyse pooled microdata from 474 standardised customer surveys conducted across 31 countries between 2020 and 2023, covering almost 79,000 product users across 6 core technologies and seven appliances, collected by 60Decibels on behalf of 164 off-grid energy companies. They consist of solar lanterns, solar home systems (SHS), mini-grids, clean cooking devices, appliances, and e-mobility. Three primary welfare outcomes are examined: improvements in quality of life, changes in income, and customer satisfaction. To recover unbiased technology-specific effects in the presence of severe ceiling effects in bounded welfare scales, we employ two-limit Tobit models with country-by-year fixed effects, complemented by three-level mixed effects estimations that account for the hierarchical nesting of respondents within and technologies within projects and companies.

We document five stylised facts. First, perceived benefits are consistently high: 93% of users report quality of life improvements, and the mean customer satisfaction score is 8.0 on a ten-point scale. Second, although off-grid deployment is reaching first-time users (who represent about three-quarters of the sample), access remains uneven: women constitute only 33% of customers, less-educated households are markedly underrepresented, and rural coverage falls short of the 83% rural share of the globally unelectrified. Third, simple, lower-cost technologies deliver the largest welfare gains: solar lanterns yield the highest quality of life improvement (0.4 points on a 5-point scale), followed by clean cooking and SHS, consistent with diminishing marginal returns to energy access at low baseline service levels. Fourth, the mechanisms of impact are technology-specific and predominantly non-monetary (safety and asset security dominate for power-providing technologies, cooking time and health savings for clean cooking, and travel convenience for e-mobility), implying that analyses focused solely on energy cost savings substantially underestimate total welfare value. Fifth, education is positively associated with perceived benefits, with tertiary-educated users reporting quality of life gains 0.25 higher than those with no schooling, indicating complementarity between off-grid technologies and human capital.

Beyond its direct empirical contributions, this study provides evidence that is foundational to the generation of sustainable future scenarios. By identifying which technology-consumer combinations produce durable welfare gains across heterogeneous populations, and by documenting where structural inequalities impede the clean energy transition, the findings offer micro-level inputs for scenario modelling of inclusive low-carbon pathways. At COP29, developed countries committed to mobilising an additional USD 300 billion annually by 2035 to support climate action in LMICs. Our results speak directly to the challenge of allocating these resources effectively: they indicate that expanding basic energy access through low-cost technologies should be prioritised for the most vulnerable population before scaling up to complex systems, and that standalone deployments must be integrated with financial inclusion, digital literacy, and social protection programmes to reach the marginalised. This positions the research as actionable evidence for policymakers and development finance institutions seeking to design forward-looking pathways aligned with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). Where equitable access, commercial viability, and environmental sustainability are simultaneously achievable.

Keywords: off-grid technologies, quality of life, inclusivity, appliances, sustainability, customer satisfaction.

Organic Rice and Sustainability in the Mediterranean: Implications for Global Health

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Planetary health recognizes the interdependence between human well-being, food production systems, and the Earth's biophysical limits. Within this framework, sustainable food production emerges as a critical strategy to address global challenges such as climate change, water scarcity, ecosystem degradation and the increasing risk of emerging diseases and pandemics¹. In the Mediterranean region, characterized by high water stress and growing demographic pressure, agricultural production, particularly of staple foods such as rice, faces the need to move towards resilient, ecological and innovative models. As a key crop for food security, rice also offers an important opportunity to integrate sustainability, technological innovation, and health risk prevention associated with intensive agri-food systems².

To analyse the potential of organic rice production in the Mediterranean as an agricultural sustainability strategy that contributes to planetary health, integrating adaptation to climate change, water-use efficiency, incorporation of new technologies and prevention of risk scenarios associated with future pandemics.

An interdisciplinary analysis was carried out based on a review of recent scientific literature on sustainable agriculture, planetary health and resilient agri-food systems, as well as on the study of experiences of organic rice production in the Mediterranean area. The methodological approach integrates perspectives of environmental sustainability, technological innovation (including precision agriculture, sensor technologies, future scenarios modelling), and health risk assessment related to the interactions among agricultural practices, biodiversity, and human health.

The results indicate that organic rice production, particularly when supported by advanced technologies, significantly reduces water consumption, greenhouse gas emissions and dependence on chemical inputs. These systems also enhance resilience to climate variability and future environmental scenarios. Furthermore, increased ecological diversification and the reduction of intensive monocultures reduce the risks of pathogen emergence and spread, thereby contributing indirectly to pandemic prevention. In the Mediterranean, these models show high potential for balancing productivity, ecosystem conservation and food security.

The transition to organic rice production in the Mediterranean represents a viable and necessary pathway toward more sustainable and resilient food systems within a planetary health framework. By integrating technological innovation, forward-looking planning, and sustainability principles, this approach not only strengthens adaptation to climate change and water scarcity but also contributes to mitigating global health risks. Sustainable agriculture thus emerges as a key pillar for preventing future crises while safeguarding both human health and the environment.

Keywords: organic rice, sustainability, agricultural technological innovation, climate change.

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Co-creation of productive and circular low-input farming systems

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Local farmers rely on the local resources to maintain or improve their yields, making the efficient use of available biomass essential for more resilient and sustainable food production. In this context, municipal pruning residues are an underused resource with strong potential to support agroecological transitions. In the Agrobiology and Soil Management group, we study the agronomic valorisation of ramial chipped wood (RCW) from urban pruning as a soil amendment to regenerate degraded horticultural soils, improve crop nutritional quality, and strengthen environmental resilience. Our work is based on the idea that soil fertility is not only a matter of increasing organic matter, but also of rebuilding functional relationships between crops, microbial communities, and the territory that sustains food production.

Through the Regensòl, Regensòl + and HORTBIOSOL projects we have shown that incorporating chipped pruning residues into horticultural soils can rapidly increase soil organic matter and nitrogen reserves while reducing dependence on external fertilizers and irrigation. The technique, applied in combination with sweet potato cultivation, promotes soil structural recovery, improves water infiltration, and contributes to a more stable and resilient agroecosystem. In parallel, we are expanding the scope of RCW-based management to include crop and rotation adaptation in regenerated soils, as well as no-tillage and mulching strategies that help maintain soil function over time. Our work also extends to vineyard systems, where no-tillage and mulching practices, combined with forest pruning residues, are being explored to improve vine health, soil quality, and grape quality within an agroforestry perspective. Beyond soil indicators, our studies also explore crop responses, including changes in nutritional quality and the interactions between plants and soil microbiota.

A central component of this research is the creation of a network of organic producers who implement this technique in real farming conditions. We are currently expanding this network, as environmental technicians from municipalities and additional researchers are joining the initiative. This network helps consolidate short value chains and circular exchanges between municipalities and farms, turning a local by-product into a resource for food production. In this way, urban pruning biomass becomes part of a broader ecological economy that reduces waste, lowers input requirements, and reinforces territorial sovereignty through local reuse, cooperation, and shared learning.

This research also has a strong social dimension in the form of the SOILSISTERS project. We are strengthening the role of women in horticulture by involving female producers in experimentation, exchange and dissemination activities. This participatory approach recognises the value of local knowledge, promotes visibility and leadership, and contributes to more inclusive and equitable agroecological innovation. By linking soil regeneration with gender inclusion and territorial cooperation, our research puts forward RCW-based management as a practical way to achieve sustainable food systems that are environmentally robust, socially just and locally rooted.

Keywords: soil regeneration, ramial chipped wood, agroecology, urban-rural circularity, gender-inclusive innovation

Developing Nature-Based-Solutions for Riparian Ecosystems restoration. From knowledge to practice (RiparianEcoRest)

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RiparianEcoRest is devoted to solving specific issues and challenges for society, such as restoring biodiversity in riparian ecosystems, improving ecosystem functions, and promoting better processing of Wastewater Treatment Plants (WWTP) effluents. United Nations proclaimed 2021-2030 as the Decade on Ecosystem Restoration. In this context, Nature-Based Solutions (NBS) provide tools to achieve the crucial challenges on preserve or restore riparian ecosystem functions such as water storage, riparian filtration, nutrient retention, and flood prevention. Aiming at restoring ecological functions, vegetation is considered critical. Nevertheless, there is still a lack of mechanistic understanding on how riparian plant biodiversity enhance Ecosystems functions recovery.

This project develops and implement a new framework of research to advance in understanding restoration success on essential functions of the riparian ecosystem structure and biodiversity. The establishment of living restoration labs serves to obtain different metrics to evaluate the restoration success. We define restoration success as the proportion in which ecosystem functions and biodiversity are re-established in relation to reference conditions. The conceptual project framework is based on the ecological theory of the relationships between biodiversity and ecosystem function. We offer a novel perspective to validate the effectiveness of certain bioengineering techniques. These techniques are inspired by nature-based solutions and help to improve the fluvial functionality, mainly for intermittent streams affected by effluents from WWTPs. We also work on demonstrating that it is much more necessary to focus on improving fluvial habitats and perhaps not so much on improving the operation of WWTPs since it is usually, in most cases, much more expensive. Actions carried out with these bioengineering techniques can offer much more resilience to anthropic pressures and extreme hydrological events (floods or droughts) than with classical engineering solutions.

Despite having achieved an improvement in the efficiency of the WWTPs, here we launched the idea that the self-purification capacity of rivers should be strengthened to comply with the environmental requirements of European directives. The results derived from this project will contribute to improving the management of river ecosystems, by considering the importance of the interaction between river and riparian ecosystems. Project results point to key issues considered in national and international strategic plans for the improvement of environmental standard, as well as for more efficient use of good quality of freshwater under water scarcity conditions; as well as those related to fluvial habitats restoration and recovering the functionality of the riparian zone by enhancing biodiversity. Therefore, the results from this project will contribute to the well-being of the population, and to an improvement of the fluvial ecosystem services.

Project PID2022-141330OB-I00. IP 1: Santi Sabaté, IP 2: Francesc Sabater. MINISTERIO DE CIENCIA E INNOVACIÓN. Participants (Teresa Sauras-Yera, Daniel Nadal-Sala, Núria Roca Pascual, Maren L. Müller, Samuel Allasia Grau, Adrià Casacuberta Vilaró, Anne Vallez Zaspé). Naturalea S.L.: Albert Sorolla.

Keywords: biodiversity, riparian ecosystems, ecological restoration, nature-based-solutions, water management.

Corporate Purpose from Within as Sustainable Organizational Future

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Corporate Purpose has become a central concept in debates about the changing role of organizations in society. In a context shaped by environmental degradation, social inequality, declining institutional trust, and growing expectations around responsible business conduct, companies are increasingly asked to clarify why they exist and what kind of contribution they make to the common good. Corporate Purpose can therefore be understood as one pathway for imagining sustainable organizational futures: a model in which organizations move beyond short-term financial performance and orient their strategies, decisions, and practices toward broader social and environmental value creation. This communication argues that such a pathway can only be credible if Corporate Purpose begins inside the organization. Purpose is often discussed through external commitments, sustainability strategies, mission statements, or reputational narratives. Yet organizations do not enact purpose in the abstract. It is employees who interpret, carry, negotiate, and translate purpose into everyday work. For this reason, the social sustainability of Corporate Purpose depends on whether employees experience it as coherent, credible, and reflected in organizational practice. Drawing on doctoral research on Corporate Purpose and psychosocial outcomes, this communication examines the internal conditions through which purpose-driven organizations may become socially sustainable. The central question is how employees' psychosocial experience shapes the credibility and sustainability of Corporate Purpose. Rather than treating Corporate Purpose as a strategic orientation or external commitment, the research approaches it as a lived organizational phenomenon with consequences for employees' experience of work. When employees perceive a connection between corporate purpose and organizational reality, purpose may support trust, motivation, belonging, and participation in organizational life. When purpose is experienced as symbolic, inconsistent, or distant from lived organizational realities, it may instead produce cynicism, disengagement, or tension between declared values and everyday experience. This research places employees' psychosocial experience at the center of the discussion on sustainable organizations. From this perspective, employees' experiences are not a secondary consequence of Corporate Purpose. They are the starting point from which purpose-driven sustainability becomes possible. The study contributes to debates on sustainable futures by reframing Corporate Purpose and suggesting that the credibility of purpose-driven business depends on the consistency between external sustainability claims, organizational practices, and employees lived experience. It offers a framework for reimagining organizations as spaces where sustainable futures can be constructed from within.

Keywords: corporate purpose, sustainable futures, psychosocial outcomes, sustainable organizations

Towards Integrated Metropolitan Mobility: Governance Instruments and Policy Dynamics in Spain

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This research examines the governance of mobility in Spanish metropolitan areas through the METROMOB project (funded by the Spanish Ministry of Science). Mobility is a key element in shaping metropolitan configurations: the daily lives of many residents in Spain span multiple municipalities, whether for work, education, family care, social activities, personal development, or leisure. Metropolitan mobility planning and management are increasingly critical for addressing the challenges of sustainable urban development and ensuring quality of life. Providing citizens with an efficient, accessible, coordinated, and interconnected mobility system helps mitigate the climate crisis and urban pollution, enhances access to transport for all social groups, fosters economic development, and promotes social and gender equity and inclusion¹.

Despite its importance, political analyses of mobility remain scarce, particularly those focusing on cooperation instruments between municipalities at the metropolitan scale². The research addresses the following questions: Which metropolitan governance instruments are most common? Why are some urban agglomerations more advanced in mobility policies than others? Which governance models are most suitable for implementing integrated and effective sustainable mobility policies?

Based on an analysis of Spain's 47 functional urban areas, the METROMOB project unfolds in three phases. First, an extensive stage has produced a database of metropolitan governance instruments related to mobility, enabling their characterization and mapping of sustainable mobility policies³. Second, an intensive stage will involve qualitative case studies based on document analysis and semi-structured interviews with political, technical, and social actors. Finally, the third phase will focus on synthesizing and disseminating results. At the conference, I will present the main findings from the first stage, highlighting emerging trends in metropolitan mobility governance.

Keywords: sustainable mobility, metropolitan governance, functional urban areas

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Integrated Assessment of Environmental and Social Sustainability for Industrial Heat Decarbonization in the Mediterranean

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The GREENOLIVE project (Interreg NEXT MED) aims to demonstrate and upscale an innovative solution for industrial decarbonization based on the integration of solar photovoltaics, Power-to-Heat technologies and Thermal Energy Storage (TES), targeting medium-temperature industrial processes and enabling replication across energy-intensive sectors in the Mediterranean region. Within this framework, Work Package 5 (WP5) addresses the need for robust assessment methodologies and inclusive stakeholder engagement mechanisms to support evidence-based decision-making and the sustainable deployment of renewable-based industrial heat solutions.

This contribution presents an interdisciplinary approach that combines quantitative environmental assessment with structured social research tools. The University of Barcelona (UB) contributes to WP5 by integrating Life Cycle Assessment (LCA) with participatory instruments designed to assess technological performance, replicability, and socio-economic feasibility. As a first step, an LCA of the current industrial process at the ASCHEM polystyrene plant (Türkiye) has been initiated, establishing a baseline scenario that enables a quantitative comparison with the future implementation of the GREENOLIVE hybrid renewable system. The baseline assessment focuses on identifying environmental hotspots, energy demand profiles, and key performance indicators relevant to industrial decarbonization under Mediterranean climatic and operational conditions.

Preliminary results indicate that the proposed hybrid system could supply up to 70% of the process heat demand, reduce natural gas consumption by approximately 3.5 GWh per year, and avoid more than 700 tonnes of CO₂-equivalent emissions annually in its initial phase. The integration of TES is shown to be a critical element for managing the temporal variability of renewable energy, enabling load shifting and increasing operational flexibility at a substantially lower cost compared to battery-based storage solutions¹. These features are particularly relevant for high-temperature, continuous industrial processes, where reliability and cost competitiveness are decisive factors.

In parallel, WP5 incorporates participatory methodologies to capture non-technical dimensions that influence technology uptake. In collaboration with the Catalan Institute of Energy (ICAEN), acting as an associate partner, UB is designing a cross-sectoral industrial survey to identify technical constraints, readiness levels, investment drivers and perceived barriers to the adoption of renewable-based industrial heat. Furthermore, a multi-stakeholder focus discussion group is being co-created to integrate perspectives from industry, policy makers, and civil society into the assessment process, strengthening the relevance and transferability of the results.

The contribution stems from collaboration between the DIOPMA research group and researchers from the Department of Sociology of the UB. It demonstrates how the systematic integration of LCA with stakeholder-based analysis enhances both the technical robustness and the societal relevance of industrial decarbonization pathways². The proposed framework is replicable across sectors and regions and supports the development of low-carbon, energy-efficient and resilient industrial systems aligned with Sustainable Development Goals 7, 9, 12 and 13.

Keywords: industrial decarbonization, power-to-heat technologies, thermal energy storage, environmental assessment, social sustainability.

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Cycle of Life: Farmhouses and Townhouses of Matarranya – Preserving Ethnological Heritage for Sustainable Rural Futures

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This research presents the project "Cycle of Life: Farmhouses and Townhouses of Matarranya," a documentary series and ethnographic study focused on the traditional rural life and architectural heritage of the Matarranya region (Aragon). In a globalized context characterized by rapid social transformation and the risk of rural depopulation, this project documents the ancestral traditions and the tangible and intangible legacy of the local "*masos*" (farmhouses).

The study utilizes a multi-disciplinary approach, combining historical documentation with oral memory to capture the essence of rural life across the four seasons. By recording the testimonies of local residents and documenting traditional building techniques and land management, the project aims to prevent the permanent loss of this cultural identity. The research emphasizes that the preservation of ethnological heritage is not merely an act of nostalgia but a foundational pillar for social sustainability.

Regarding the generation of sustainable future scenarios, this research contributes by proposing a model where cultural heritage acts as a driver for local development. By revaluing traditional knowledge and the historical relationship between the community and its environment, we create a sense of belonging and resilience among the younger generations. This awareness is crucial for developing sustainable tourism and architectural rehabilitation policies that respect the local ecosystem, thereby offering a viable alternative to rural abandonment and ensuring the continuity of the community's social fabric.

Keywords: Matarranya, ethnological heritage, rural sustainability, intangible legacy, cultural preservation

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List of researchers

Abstract	Researchers
Towards post-growth policymaking: Barriers and enablers for government-led sustainability initiatives	Angresius, Laura
Participatory educational itineraries as a training proposal for imagining and building sustainable futures in initial teacher education. A GreenComp-informed diagnostic and pedagogical intervention	Arévalo-Rauschenbach, Beatriz; Vancea, Mihaela
Three Proposals for European Private Contract Law Aimed at Effective Sustainability	Arnau Raventós, Lúdia
REGENET: Enhancing Urban Water Sustainability through Laundry Greywater Regeneration and Reuse	Bayarri Ferrer, Bernardí; Sandoval Nieto, Julia
Vulnerable groups and the digitalization of judicial proceedings: toward sustainable justice	Cano Fernández, Sonia
Modeling Arctic Freshwater Dynamics to Inform Global Climate Resilience and Sustainable Future Scenarios	Crespin, Julia
Nanotechnology Education for Sustainable Futures: El legado de Nanoinventum, integrating MOOCs and Project-Based Learning through Nanorobot Design	Díaz Marcos, Jordi
Sustainable nitrate remediation techniques within a circular economy framework	Escalona-Orellana, Helena
Towards sustainable veterinary surveillance: environmental monitoring of	Estarlich-Landajo, Ignasi

bluetongue virus in farms and
slaughterhouses

Necessary Cost or Irresponsible Excess? Public Legitimacy of Energy-Intensive AI Development and Sustainable Futures in Cross-Platform Discourse	Fang, Qingguo
Private law tools for the Renovation Wave	Garcia-Micó, Tomàs Gabriel; Anderson, Miriam
Citizenship as a driver of social sustainability: transforming mental health through participation and technological innovation	Gonzalez-Mañas, Diana; Eiroa-Orosa, Francisco José
Participatory Scenario Planning for Transforming Urban Food Systems	Herrero, Amaranta; Moragues-Faus, Ana
Bioherbicides and Allelopathy in Rice: New Approaches to Sustainable Weed Control	Just, Ainhoa; Nogués, Salvador; Serrat, Xavier
Climate Change - "The Measure of All Things": The Missing Map of Climate Narratives	Kulaeva, Zarina
New findings on the links between climate, soil natural capital and multifunctionality for sustainable and resilient agroecosystems	Lladó, Salvador
Designing and Validating an Educational Programme to Foster Transversal Sustainability Competencies in Higher Education	Montenegro Lizárraga, María Eugenia
Towards Sustainable Urban Water Management: Stormwater Runoff Treatment for Reuse	Nieto-Sandoval, Julia
The Third Mission of Universities as Hubs of Social Cohesion in Shaping Sustainable EU-Ukraine Futures	Nifatova Olena; Konovalova Marta

Large-Scale Evidence on Who Benefits from Off-grid Energy	Ntsiful, Enoch; Cohen, Francois
Organic Rice and Sustainability in the Mediterranean: Implications for Global Health	Orduño, Miguel Angel; Nogués, Salvador
Co-creation of productive and circular low-input farming systems	Pérez-Llorca, Marina
Developing Nature-Based Solutions for Riparian Ecosystems restoration. From knowledge to practice (RiparianEcoRest)	Sabaté Jorba, Santi
Corporate Purpose from Within as Sustainable Organizational Future	Skhirtladze, Ela
Towards Integrated Metropolitan Mobility: Governance Instruments and Policy Dynamics in Spain	Tomàs, Mariona
Integrated Assessment of Environmental and Social Sustainability for Industrial Heat Decarbonization in the Mediterranean	Vielma, Carlos A.; Fernández, Ana Inés
Cycle of Life: Farmhouses and Townhouses of Matarranya - Preserving Ethnological Heritage for Sustainable Rural Futures	Ysamat Alarcón, Sílvia; Pallarés Pascual, Vicent

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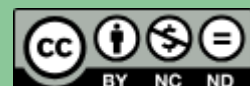
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