#ENVECON11

11th ENVECON Conference

31 October – 01 November 2025 | HYBRID

SCOPE

Main issues that concern the Economics of Natural Resources and the Environment.

AIM

Highlight the interdisciplinary nature of environmental research through the exchange of views and experiences of researchers from different scientific fields and the finding of common components of research approaches.

Co-Organized by

Laboratory of Operations Research, UTH

Laboratory of Economics of Strategy, Innovation and Sustainability (LENS), UoP

Conference Organization

Laboratory of Operations Research
Department of Economics | University of Thessaly

Laboratory of Economics of Strategy, Innovation and Sustainability
Department of Economics | University of Patras

Book of Abstracts – 11 ENVECON Conference
Economics Natural Resources & the Environment

Opening Speech for the 11th ENVECON Conference

Dear,
Distinguished guests, esteemed colleagues, and students,

On behalf of the Scientific and Organizing Committee I welcome you to the:
11th Conference on "**Economics of Natural Resources and the Environment**".

It is with immense pride and heartfelt gratitude that I welcome you all to our 11th ENVECON Conference with the scope of "***Sustainability in the Face of Uncertainty***." This year, the conference is co-organised by the ***Laboratory of Operations Research*** (Department of Economics, University of Thessaly) and the ***Laboratory of Economics of Strategy, Innovation and Sustainability (LENS)*** (Department of Economics, University of Patras).

Last year, we celebrated the 10th anniversary of the ENVECON Conference, a testament to the shared efforts of our team, partners, and community, whose dedication has built an organization delivering rigorous science with real policy impact. ENVECON began with a small, determined group committed to disseminating environmental science across diverse fields, and it has grown through resilience and innovation in the face of challenges.

Our journey is marked by four milestones: an initial national phase with four conferences at the University of Thessaly (two on Climate Change in 2014 and two on Environmental Economics in 2015–2016); an international expansion with the 5th ENVECON in 2018; a period of collaboration and openness featuring jointly organized, often online, conferences from 2021 to 2023; and last year's 10th Anniversary ENVECON at the UTH. The conference's core aim is to underscore the relevance of natural resource and environmental economics and to elevate interdisciplinary exchange, drawing on a decade of lessons to spark new ideas, forge partnerships, and shape an even more impactful decade ahead.

I would also like to wholeheartedly thank the keynote speakers of the 11th ENVECON Conference: Prof. ***Ugur Soytas*** (Technical University of Denmark, Denmark, Denmark), Prof. ***Massimiliano Mazzanti*** (University of Ferrara, Italy), Prof. ***Tooraj Jamasb*** (Copenhagen Business School, Denmark), and Prof. ***John Yfantopoulos*** (National and Kapodistrian University of Athens, Greece) who accepted the invitation to present their long-term remarkable research experience on topics relevant to the conference.

Thank you once again for being here to celebrate this special moment with us, as we are here ***93 participants*** from ***58 institutions***. Whether you have been with us since the beginning or joined us along the way, you are part of our story. Together, let us make this conference a memorable one, filled with insight, connection, and inspiration.

ENVECON Conference Scientific Coordinator
Professor George E. Halkos
Laboratory of Operations Research
Department of Economics
School of Economics and Business
University of Thessaly, Volos, Greece

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Keynote Speakers

Environmental policies and innovation: theory, methods, empirical evidence

Prof. Massimiliano Mazzanti

Full Professor of Economic Policy

University of Ferrara, Italy

Sustainable societal well-being as an overarching target for energy and climate policies

Prof. Ugur Soytas

Professor & Head of the Climate Economics and Risk Management Section

Technical University of Denmark, Denmark

Green (Energy) Transition and Inequality

Prof. Tooraj Jamasb

Endowed Professor of Energy Economics
Director for Copenhagen School of Energy Infrastructure (CSEI)

Copenhagen Business School, Denmark

Sustainability of Public Social Spending in Greece, 1995-2023

Prof. John Yfantopoulos

Professor of Health Economics & Management

National and Kapodistrian University of Athens, Greece

Concise Conference Programme

Greek Time	Sessions – Topics Day 1 – Friday 31/10/2025
09:30 -10:00	**Opening – Welcome**
10:00-12:00	**Session 1:** Energy: Poverty, Deprivation & Mix in transition *Chairperson: Professor Konstantinos Kounetas*
10:00-12:00	**Session 2:** Climate Change Adaptation: Land Use, Forest & Agriculture *Chairperson: Assoc. Professor Konstantinos Papaspyropoulos*
12:00-12:15	**Coffee Break**
12:15 -13:00	**Keynote Speaker:** Professor Massimiliano Mazzanti
13:00-13:30	**Lunch**
13:30-15:15	**Session 3:** Climate Change: Natural Disasters & Environmental Hazards *Chairperson: Director Dr. Jaime Moll de Alba*
13:30-15:15	**Session 4:** Nature-based Solutions, Innovation & Resilience *Chairperson: Professor Konstantinos Tsekouras*
15:15- 15:30	**Coffee Break**
15:30-17:15	**Session 5:** Circular Economy: Water & Waste Management *Chairperson: Professor George Halkos*
15:30-17:15	**Session 6:** Digitization in Sustainable Tourism *Chairperson: Professor Zacharoula Andreopoulou*
17:15-17:30	**Coffee Break**
17:30-19:30	**Session 7:** Environmental Pollution: Urban, Health & Industrial Dimensions *Chairperson: Professor Christos Kitsos*
19:30-20:15	**Keynote Speaker:** Professor Ugur Soytas
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10:00-11:30	**Session 8:** Novelties in Environmental Valuation under Uncertainty *Chairperson: Asst. Professor Nikolaos Chatzistamoulou*
11:30-11:45	**Coffee Break**
11:45-12:30	**Keynote Speaker:** Professor Tooraj Jamasb
12:30-13:30	**Lunch**
13:30-15:00	**Session 9:** Climate Anxiety & Ecological Awareness *Chairperson: Assoc. Professor Athina Economou*
15:00-16:30	**Session 10:** Sustainable Development: Degrowth & Inclusive Wealth *Chairperson: Professor George Halkos*
16:30-16:45	**Coffee Break**
16:45-17:30	**Keynote Speaker:** Professor John Yfantopoulos
17:30-19:15	**Session 11:** CSR - ESG *Chairperson: Professor Konstantinos Evangelinos*
19:15-19:30	**Closing Remarks of the 11th ENVECON Conference**

Conference Schedule

Friday 31 October

Opening – Welcome – Room 01 **09:30-10:00**

- Prof. *George Halkos*, ENVECON Conference Scientific Coordinator, Department of Economics, UTH
- Prof. *Chrysi Laspidou*, Department of Civil Engineering, Vice Rector of UTH
- Prof. *Ilias Kevork*, Head of Department of Economics, UTH
- Prof. *Ioannis Venetis*, Department of Economics, Vice Rector of UoP
- Prof. *Nikolaos Giannakopoulos*, Head of Department of Economics, UoP
- Prof. *Konstantinos Kounetas*, Department of Economics, Dean of Economics and Business Administration School, UoP
- Prof. *Konstantinos Tsekouras*, Department of Economics, UoP

1st Session – Room 01 **10:00-12:00**

Topic	**Energy: Poverty, Deprivation & Mix in transition**
Chairperson	**Prof. Konstantinos Kounetas**
10:00-10:20	*Rebound effect-A Sisyphean effort or a Chimera? Evidence from transient, persistent and energy efficiency in European Industries* Eirini Stergiou, Nikos Rigas, Giancarlo Ferrara & Konstantinos Kounetas
10:20-10:40	*Energy Developments and Military Expenditure in the Eastern Mediterranean* George E. Halkos & Vasileios Avramopoulos
10:40-11:00	*Energy Poverty, Health, and Child Malnutrition: Panel Evidence from Southeast Asia* Nguyet T.M. Tran & Trung Thanh Nguyen
11:00-11:20	*The Energy Mix in Transition: A Dynamic Approach to the Shift from Non-Renewable to Renewable Sources under Climate Change Constraints* George E. Halkos & Argyro Zisiadou
11:20-11:40	*Uncovering Clean Energy Deprivation in Bhutan: A Multidimensional Analysis of Household Clean Energy Use* Rinzin Dema, Viet-Ngu Hoang & Clevo Wilson

2nd Session – Room 02 **10:00-12:00**

Topic	Climate Change Adaptation: Land Use, Forest & Agriculture
Chairperson	**Assoc. Prof. Konstantinos Papaspyropoulos**
10:00-10:20	*STREMMiAA: A Farm-Level Simulation Model for Assessing Structural Change, Land-Use, and Environmental Dynamics* Stamatis Mantziaris
10:20-10:40	*Economic Valuation and Determinants of Residents' Willingness to Pay for Conservation in the Dadia–Lefkimi–Soufli Forest National Park* Aggelos Symeonidis, Chrysovalantis Malesios, Eleni Zafeiriou, Spyridon Galatsidas, Konstantinos Panytsidis & Garyfallos Arabatzis
10:40-11:00	*How Climate Change is Addressed in the Faustmann Forest Economics Model: A brief review* Sofia Mpekiri & Konstantinos G. Papaspyropoulos
11:00-11:20	*Quantile estimation of CO_2 marginal abatement cost under heterogeneous emission-generating technologies* Haleh Delnava & Sheng Dai
11:20-11:40	*Sustainable Practices and Climate Change Adaptation in Olive Farming: Insights from Producers in Aetolia–Acarnania, Greece* Vassiliki Psilou, Eleni Zafeiriou, Chrysovalantou Antonopoulou, Christos Chatzissavvidis & Garyfallos Arabatzis

Coffee Break **12:00-12:15**

Keynote Speaker – Room 01 **12:15-13:00**

Topic: "Environmental policies and innovation: theory, methods, empirical evidence"

Prof. Massimiliano Mazzanti

Full Professor of Economic Policy
University of Ferrara, Italy

Lunch Break **13:00-13:30**

3rd Session – Room 01 **13:30-15:15**

Topic	**Climate Change: Natural Disasters & Environmental Hazards**
Chairperson	**Director Dr. Jaime Moll de Alba**
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13:50-14:10	*Sense-Making and Resilience Perspectives of Austrian Micro and Small Enterprises Towards Flooding: A Qualitative Study* Tabea Böhler & Antonis Skouloudis
14:10-14:30	*Extreme weather and individual preferences in rural Thailand and Vietnam* Tri-Anh Duc Nguyen, Gokul P. Paudel & Trung Thanh Nguyen
14:30-14:50	*(C)yber (D)igital (R)isks: Revising the Framework Modern Threats Landscape for Environmental Hazards* Argyro Zisiadou, Apostolos Xenakis & George E. Halkos

4th Session – Room 02 **13:30-15:15**

Topic	**Nature-based Solutions, Innovation & Resilience**
Chairperson	**Prof. Konstantinos Tsekouras**
13:30-13:50	*EUNICoast*
13:50-14:10	*Sustaining Environmental Resilience: A Stackelberg Game* George E. Halkos & George J. Papageorgiou
14:10-14:30	*Eco-process innovation: a "win win" situation or "when you have lemons make lemonade"? The moderating role of marketing innovation* Areti Gkypali, George Koutsouradis & Kostas Tsekouras
14:30-14:50	*Conceptualizing the Symbiosis Maturity for Nature-based Solutions: A SWOT-driven framework across technical, environmental, management and institutional domains* Dimitris Kofinas, Evmorfia Bataka, Nikos Kokosis, Argyro Zisiadou, Panagiotis-Stavros C. Aslanidis, George E. Halkos & Chrysi Laspidou

Coffee Break **15:15-15:30**

5th Session – Room 01 **15:30-17:15**

Topic	**Circular Economy: Water & Waste Management**
Chairperson	**Prof. George Halkos**
15:30-15:50	*Water management practices in Ancient Greece* Emmanouil M.L. Economou & George E. Halkos
15:50-16:10	*Join the dots: A rapid temporal appraisal of the bioeconomy in NUTS II regions in Greece* Georgios Maroulis, Panagiotis Koronaios & Panagiotis Kalimeris
16:10-16:30	*Knowledge, aspects and habits of the residents of Zakynthos, regarding solid waste recycling in the island* Stylianos-Marinos Charalampidis
16:30-16:50	*Toward sustainable Waste for Electrical and Engineering Equipment indicators: Addressing missing values with Coverage mapping, Imputation and Validation* Christos Liotiris & Zacharoula Andreopoulou

6th Session – Room 02 **15:30-17:15**

Topic	**Digitization in Sustainable Tourism**
Chairperson	**Prof. Zacharoula Andreopoulou**
15:30-15:50	*The Digitization of Archaeological Museums as a tool for Sustainable Tourism and Local Development: Evidence from Central Macedonia Greece* Konstadina Bataoula & Zacharoula Andreopoulou
15:50-16:10	*Integrating multi-source data and visualization of heterogeneous time-series for lakes: NDWI surface, ERA5 precipitation, level and fishery production* Lavrentis Konstantinidis, Zacharoula Andreopoulou
16:10-16:30	*Sustainability in Tourism in Greece using e-tourism: the case of Ecohotels and Expedia online platforms in e-Reputation* Ioannis Papathanasiou & Zacharoula Andreopoulou
16:30-16:50	*The Significance of Photography and Video User Generated and Shared Content in Mountainous Sustainable Tourism: The Case of Mount Olympus National Park* Argyrios Georgilas & Zacharoula Andreopoulou

Coffee Break **17:15-17:30**

7th Session – Room 01 **17:30-19:30**

Topic	**Environmental Pollution: Urban, Health & Industrial Dimensions**
Chairperson	**Prof. Christos Kitsos**
17:30-17:50	*Stairways to Heaven for European Industries: Multi-driving paths for CO_2 emissions generation* Eirini Stergiou & Konstantinos Kounetas
17:50-18:10	*Regulation schemes for pollutants. Multiple steady states and pollution traps.* George E. Halkos & George J. Papageorgiou
18:10-18:30	*Urban centers, Traffic, Atmospheric Pollution and Associated Health Risks: Evidence from Africa* Bertrand Tchanche
18:30-18:50	*A Marxist analysis of the Relation Between CO_2 Emissions Growth and Sectoral Profitability* Theofanis Papageorgiou & Yorgos Pisinas
18:50-19:10	*The Pollution levels in Athens and Salonica: An Environmental Analysis Approach* George E. Halkos, Christos Kitsos & Simeon Nisiotis

Keynote Speaker – Room 01 **19:30-20:15**

Topic: "Sustainable societal well-being as an overarching target for energy and climate policies"

Prof. Ugur Soytas

Professor & Head of the Climate Economics and Risk Management Section
Technical University of Denmark, Denmark

Saturday 01 November

8th Session – Room 01 **10:00-11:30**

Topic	Novelties in Environmental Valuation under Uncertainty
Chairperson	**Asst. Prof. Nikolaos Chatzistamoulou**
10:00-10:20	*Environmental Uncertainty Effects on Money Investments: Strengthening or Weakening Resilience to Inflation?* Panayiotis Theodossiou, Nikolaos A. Kyriazis & Konstantinos A. Dimitriadis
10:20-10:40	*Reinstatement of Rail Transport Between Strymon and Alexandroupolis – an Environmental, Financial, and Economic Evaluation* Konstantinos Christidis
10:40-11:00	*Digital Self-Assessment of Accommodation Vulnerability to Climate Change Using Artificial Intelligence Tools* Panagiotis Vouros, Akrivi Vagena, Eva Vaiouli, Konstantinos Evangelinos
11:00-11:20	*Impact of Artificial Intelligence Implementation on Sustainability in Colombo's Business Process Outsourcing Sector in Sri Lanka* S.J.Francis & N. Wijesena

Coffee Break **11:30-11:45**

Keynote Speaker – Room 01 **11:45-12:30**

Green (Energy) Transition and Inequality

Prof. Tooraj Jamasb

Endowed Professor of Energy Economics
Director for Copenhagen School of Energy Infrastructure (CSEI)
Copenhagen Business School, Denmark

Lunch **12:30-13:30**

9th Session – Room 01 **13:30-15:00**

Topic	**Climate Anxiety & Ecological Awareness**
Chairperson	**Assoc. Prof. Athina Economou**
13:30-13:50	*The influence of motivational goal frames and coping strategies on climate anxiety* Anastasia Gkargkavouzi & George E. Halkos
13:50-14:10	*The Role of Environmental Education in Promoting Sustainable Development and Ecological Awareness: An Economic & Social Approach* Christos Chatzifotiadis, Efstathios Loupas, Ifigeneia Chatzinikolaou & Konstantinos Mantzios
14:10-14:30	*The Contribution of the Psychology of Religion to the Formation of Ecological Consciousness* Georgios Fountoulakis
14:30-14:50	*Socioeconomic status and pro-environmental behaviours in the EU* Athina Economou & George E. Halkos

10th Session – Room 01 **15:00-16:30**

Topic	**Sustainable Development: Degrowth & Inclusive Wealth**
Chairperson	**Prof. George Halkos**
15:00-15:20	*The role of institutional and socio-economic factors in shaping environmental performance: A cross-country analysis in fluctuating times* Jawahir M. Alshehhi & Panagiotis D. Zervopoulos
15:20-15:40	*The Economic Geography of Inclusive Wealth: Convergence Clubs Across Nations* George E. Halkos, Christina Bampatsou, Panagiotis – Stavros C. Aslanidis & Shunsuke Managi
15:40-16:00	*Degrowth and Planetary Boundaries: Economic Dimensions of an Alternative Paradigm for Sustainable Transition* Angeliki Spyridoula Kalousi & Konstantinos G. Papaspyropoulos
16:00-16:20	*Transitional Dynamics and Policy Spillovers. Are Market-Based Instruments and Technology Autarky Structural Drivers in the European Green Transition?* Nikos Chatzistamoulou, Andriana G. Dimakopoulou & Dimitris Smyrnakis

Coffee Break **16:30-16:45**

Keynote Speaker – Room 01 **16:45-17:30**

Topic: "Sustainability of Public Social Spending in Greece, 1995-2023"

Prof. John Yfantopoulos

Professor of Health Economics & Management
National and Kapodistrian University of Athens, Greece

11th Session – Room 01 **17:30-19:15**

Topic	**Corporate Social Responsibility – Environmental, Social and Corporate Governance**
Chairperson	**Prof. Konstantinos Evangelinos**
17:30-17:50	*The role of internal CSR as driver of sustainable innovation through intrapreneurship* Panayiotis Jacovides, Constantinos Giagkinis & Constantinos Evangelinos
17:50-18:10	*Disability and Social Economy: Corporate Responsibility for Equal Employment Opportunities in NGOs* Kristina Kucheruk & Konstantinos Evangelinos
18:10-18:30	*Embedding ESG in European Small-Medium Enterprises: The Role of Environmental Management Systems and International Standards* Panagiotis – Stavros C. Aslanidis, Jaime Moll de Alba & George E. Halkos
18:30-18:50	*Corporate Social Responsibility as a New Perspective for Tackling the Refugee Problem* Anna Samothraki & Konstantinos I. Evangelinos

Closing Remarks **19:15-19:30**

Book of Abstracts

Keynote Speeches

Sustainable societal well-being as an overarching target for energy and climate policies

Ugur Soytas[1]

[1] Professor & Head of the Climate Economics and Risk Management Section, Technical University of Denmark, Denmark

Abstract

Ecological economists propose sustainable societal well-being (SW) as an overarching target for climate policies. A better understanding of how SW is linked to energy consumption is needed to operationalize this proposal. Examining how the Human Development Index (HDI) correlates with per capita energy use, several studies confirm diminishing SW returns for developed countries and saturation at very high energy consumption levels. However, when planetary pressures are considered, PHDI declines with overconsumption, akin to the income threshold hypothesis. Furthermore, the hedonic and eudaimonic well-being show different associations with resource use, indicating that SW can decouple from energy use.

Keywords: *sustainable well-being; HDI/PHDI; energy use*

JEL Codes: I31; Q01; Q43

Environmental policies and innovation: theory, methods, empirical evidence

Massimiliano Mazzanti[1]

[1] Full Professor of Economic Policy, University of Ferrara, Italy

Abstract

When analysing environmental policy effects, it is relevant to understand the drivers of innovation, including policies, and the role of policy in abating emissions, taking into account country heterogeneity, non linearity, common factors. In a series of recent works, it is highlighted (i) that the larger knowledge investments are, the stronger the possible role of environmental policy in inducing green inventions. The higher the combination of any R&D/R&D spillovers, the stronger socio-technical system capacity to absorb the effect of the policy, translating this into inventions. In addition, (ii) carbon pricing effects on CO2 were significant at the level of the entire economy, not only for sectors covered by the EU ETS policy. Despite the strong non linearity the market exhibited, the policy appears to deliver efficiency gains by Innovation spillovers throughout the entire economic system.

Keywords: *carbon pricing & EU ETS spillovers; R&D/knowledge spillovers and absorptive capacity; policy-induced green innovation & economy-wide CO_2 abatement*

JEL Codes: O31; Q55; Q58

Green (Energy) Transition and Inequality

Tooraj Jamasb[1]

[1] Endowed Professor of Energy Economics, Director for Copenhagen School of Energy Infrastructure (CSEI), Copenhagen Business School, Denmark

Abstract

This presentation examines how dimensions of social inequality shape can impact the green energy transition. Contemporary transition strategies are largely framed by market oriented, techno economic models inherited from policy reforms since the 1990s. Those models tend to treat social effects as secondary or distributable externalities. However, procedural, distributional, and recognition based inequalities materially affect the political feasibility and speed of decarbonisation. The absence of an integrated social framework leaves the techno economic approach and prescriptions vulnerable to resistance and uneven uptake. The presentation concludes by proposing principles for an interdisciplinary research agenda and policy design incorporating distributive justice and participation into modelling and policymaking to enable more equitable—and therefore more durable—green transition.

Keywords: *energy justice & social inequality; participatory governance in decarbonisation; limits of techno-economic transition models*

JEL Codes: D63; Q48; Q58

Sustainability of Public Social Spending in Greece, 1995-2023

John Yfantopoulos[1] & Theodoros V. Stamatopoulos[2]

[1] Professor of Health Economics & Management, National and Kapodistrian University of Athens, Greece
[2] Professor of Economics, Department of Accounting and Finance, University of West Attica, Greece

Abstract

We investigate the sustainability of the asymmetric public social spending (PSS)–financialization relationship in Greece over the period of 1995q1–2023q4. We follow the theoretical endogenous nexus of PSS with the financial fragility hypothesis (FFH) and finance-led growth regime; the nonlinear autoregressive distributed lag (NARDL) model and cointegration are applied for this purpose. The analysis suggests the following: (1) The selected determinants of the three stages of the FFH affect dependent PSS asymmetrically in the long run (as well as in the short run, sometimes); meanwhile, more often than not, significantly larger effects tended to be negative changes. (2) The asymmetric shocks of explanatories gently increase PSS in many cases but also decrease it strongly in others. (3) The "automatic stabilizer" role of PSS is proven, whereas the contrary is not rejected; that is, PSS was also used as a "counter-automatic stabilizer" tool.

Keywords: *public social spending & financialization; NARDL; Greece*

JEL Codes: H53; E44; C22

Session 1.

Energy: Poverty, Deprivation & Mix in Transition

Rebound effect-A Sisyphean effort or a Chimera? Evidence from transient, persistent and energy efficiency in European Industries

Eirini Stergiou[1,4], Nikos Rigas[2], Giancarlo Ferrara[3] & Konstantinos Kounetas[1,4]

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Abstract

The energy efficiency paradox dictates that the potential reduction in CO_2 emissions by energy-efficient technologies can be offset by behavioral and systemic responses that increase energy use and diminish energy savings. At the same time, European manufacturing industries need to reduce their energy consumption and increase their capability to substitute between their resources. This study employs a stochastic frontier energy demand framework to 11 manufacturing industries from 27 European countries over the period 1995 to 2022, examining substitution elasticities among key production inputs and distinguishing between transient and persistent inefficiencies. The rebound effect of energy efficiency improvements is evaluated to capture if the expected energy savings are offset by increased production or energy use. Our results in efficiency analysis indicate that improvements in industrial energy performance require long-term structural reforms and targeted investments in technological advancement, rather than short-lived policy interventions. Moreover, complementarity and substitutability analysis reveal that energy–labor substitutability is prevalent in most industries, except for the Mining and Chemical industries. The energy–capital relationship presents both substitutability and complementarity depending on industry characteristics, technology intensity, and energy dependence, with energy-intensive industries displaying more elastic substitution patterns. In conclusion, Europe's pathway to energy efficiency, industrial decarbonization and climate neutrality requires a dual approach: addressing long-term structural inefficiencies, while simultaneously mitigating short-term rebound effects.

Keywords: *Energy demand, Stochastic frontier analysis, Rebound effect*

JEL Codes: O13; O14; Q56.

Energy Developments and Military Expenditure in the Eastern Mediterranean

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Abstract

Energy development and military expenditure are two strategic dimensions that shape the geopolitical and economic landscape of the Eastern Mediterranean. This study explores the patterns and possible associations between these two areas across nine countries over a twenty-year period (2004–2023). Using secondary panel data, the analysis presents temporal and cross-country trends in military spending-both in current U.S. dollars and as a percentage of GDP-alongside selected indicators of energy development. Since there is no single, agreed-upon definition of "energy development," this study operationalizes it through four dimensions: Contracts between States and hydrocarbon companies, hydrocarbon exploration or discovery, participation in international energy fora, declaration or delimitation of Exclusive Economic Zones, along with military crises or conflicts. Visual analyses, including line plots and heatmaps, are employed to illustrate how military and energy trajectories have evolved across countries and time. The findings reveal notable regional heterogeneity: Countries that have been historically exposed to external threats tend to allocate a larger share of their GDP to military expenditures. In addition, certain localized military incidents drive the countries involved to raise their defense spending as a percentage of GDP. This descriptive exploration contributes to the emerging debate on the energy–security nexus in the Eastern Mediterranean by offering an empirically grounded overview of their joint evolution. The study highlights the need for further econometric and policy-oriented research to better understand whether energy developments act as drivers or outcomes of regional militarization.

Keywords: Energy developments; Military expenditures; Eastern Mediterranean; Energy security; Energy policy.

JEL Codes: Q43; H56; Q48; F52; N75.

Energy Poverty, Health, and Child Malnutrition: Panel Evidence from Southeast Asia

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Abstract

Energy poverty poses a significant barrier to human well-being and economic development in rural developing countries. A large segment of the population in these countries relies on cheaper, more polluted fuel sources to meet energy needs, leading to adverse health consequences and hindering children's development. This study aims to examine the factors contributing to energy poverty and its impact on the health outcomes of household members, as well as the number of malnourished children in rural communities. Utilizing a panel dataset spanning 2007 to 2017 and encompassing 1,566 households in Thailand and 1,555 households in Vietnam, we propose various measures of energy poverty. We address the endogeneity concerns by applying both fixed-effects and instrumental variable estimations. Our findings demonstrate that energy poverty has been decreasing over the years, yet 35% of the population continues to rely on firewood to meet their energy needs. The results from factors affecting energy poverty suggest that employment diversification and higher levels of education pave the way out of energy poverty. Better rural infrastructure plays an important role in reducing energy poverty. Furthermore, energy poverty is consistently linked to more serious respiratory health issues and a higher share of respiratory illness. Regarding child malnutrition, suffering energy poverty positively increases the number of children who are stunted, wasted, and underweight within households. These health consequences are stronger in the long term. Our findings necessitate addressing energy poverty as a growing threat to health status, requiring attention and intervention in rural communities.

Keywords: *Energy poverty; health status; children malnutrition; panel regression, instrumental variables; Southeast Asia.*

JEL Codes: Q4; Q49; I15.

The Energy Mix in Transition: A Dynamic Approach to the Shift from Non-Renewable to Renewable Sources under Climate Change Constraints

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Abstract

This study provides a comprehensive empirical assessment of the structural transition in national energy mixes from non-renewable to renewable sources across 77 OECD and non-OECD economies during the period 2000–2024. Anchored in the evolving architecture of international climate governance, the analysis explicitly incorporates the temporal influence of the Kyoto Protocol (2005) and the Paris Agreement (2015) as institutional turning points in global decarbonization efforts. The empirical framework employs a dynamic panel data approach, using balanced data to capture both short- and long-term adjustments in energy composition under climate change constraints. Key explanatory variables include participation in climate treaties, Climate Change Performance Index (CCPI) scores, economic growth trajectories, and structural indicators of industrial and energy-sector development. The results aim to identify causal linkages between international climate commitments, policy performance, and the pace of energy transition, while differentiating the behavioral responses of OECD versus non-OECD countries. By integrating econometric rigor with policy analysis, this paper contributes novel evidence on the effectiveness of global climate frameworks in reshaping national energy systems and offers insights into the mechanisms that condition the convergence toward a sustainable low-carbon energy equilibrium.

Keywords: *Renewable and non-renewable energy; Climate Change; Energy mix; econometric modelling; Energy policy effectiveness*

JEL Codes: B23; O13; Q54

Uncovering Clean Energy Deprivation in Bhutan: A Multidimensional Analysis of Household Clean Energy Use

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Abstract

Bhutan achieves near-universal electrification and becomes a net exporter of clean electricity by 2022. However, only 32.85% of its total electricity production is used domestically, while over 82% of total firewood consumption happens in residential settings. The literature remains silent about this potential incidence of clean energy deprivation (CED) in Bhutan. Using latent class modelling on the 2022 Living Standard Survey, this study offers the first empirical examination of clean energy deprivation among Bhutanese households. Our analysis shows three distinct levels of deprivation among households: Very Deprived (16.94%), Deprived (36.38%), and Non-Deprived (46.68%). Households in the periphery and rural areas are more likely to be deprived. The degree of deprivation varies across regions, even within rural areas. Deprived households are characterised by low adoption of LPG, low spending on clean energy, and the use of firewood for cooking and heating, despite having near-universal access to electricity. The key drivers of clean energy deprivation include housing structural attributes, appliance ownership, education of the household head, distance from households to the nearest market and gas distribution points. These findings favour a shift in policy towards targeted and more holistic demand-side support.

Keywords: *Clean energy deprivation, latent class, multidimensional, household, policy*

Session 2.

Climate Change Adaptation: Land Use, Forest & Agriculture

STREMMiAA: A Farm-Level Simulation Model for Assessing Structural Change, Land-Use, and Environmental Dynamics

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Abstract

Small farms play a vital role in the rural sector of the European Union, contributing to food production, preserving landscape features, protecting biodiversity, providing public goods, and maintaining social cohesion in rural and remote regions. Nevertheless, the sector has undergone rapid structural transformation in recent decades, accompanied by adverse demographic developments that threaten the long-term sustainability of small-scale agriculture. Understanding how farms respond to evolving economic conditions and policy frameworks is therefore essential for designing effective agricultural policies. This study presents the Stochastic Recursive Model for Multiannual impact Assessment in Agriculture (STREMMiAA). This newly developed simulation model endogenously captures structural, and land-use change dynamics in arable farming systems. The model integrates a farm-level recursive linear programming framework with an ARIMA stochastic process, allowing the dynamic representation of farmers' adaptive behavior under uncertainty. A post-solution module incorporating means-based environmental indicators enables assessment of environmental performance at the farm level. The model is empirically applied to a representative sample of arable farms in Karditsa (NUTS-3 region), Greece, under three alternative scenarios: (i) Business-as-Usual (BAU), (ii) Common Agricultural Policy (CAP) post-2020, and (iii) CAP post-2020 combined with a scenario of Long War of Attrition (LWA). Simulation results reveal a consistent decline in the share of small farms (<30 ha) and a corresponding concentration of land in larger farms (≥50 ha), indicating limited long-term viability for smaller farms. Land-use projections show an expansion of food crop areas and a decline in industrial crops areas. Environmentally, reductions in water and fertilizer use under new CAP-related scenarios (ii and iii) suggest potential benefits for nitrate-polluted areas such as Karditsa.

Keywords: *Structural Change; Land Use Dynamics; Agricultural Policy; Environmental Impact Assessment; Dynamic Simulation.*

JEL Codes: C61: Q12; Q15; Q18; Q51.

Economic Valuation and Determinants of Residents' Willingness to Pay for Conservation in the Dadia–Lefkimi–Soufli Forest National Park

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Abstract

Economic valuation of protected areas is a key component in designing effective management strategies and promoting sustainable development. This study investigates residents' Willingness to Pay (WTP) for the conservation and enhancement of natural resources in the Dadia–Lefkimi–Soufli Forest National Park, a biodiversity hotspot of national and European importance. Primary data were collected through a structured questionnaire survey targeting local residents, examining perceptions of forest, grassland and water resources, landscape values and wildlife conservation. Linear regression models were employed to estimate the determinants of WTP, using socio-demographic variables and indicators of environmental awareness as predictors. The findings reveal significant variation in WTP among residents, influenced by socio-economic characteristics such as education level, employment status and place of residence. Environmental sensitivity and positive attitudes toward conservation were also found to be strong predictors of higher WTP. Residents showed the greatest willingness to contribute financially to landscape and wildlife conservation initiatives, while lower WTP values were observed for grassland and water resource management. These results highlight the importance of integrating local communities into decision-making processes and developing targeted awareness programs to strengthen social support for conservation efforts. The study provides valuable insights into the socio-economic drivers of conservation funding and supports the development of sustainable management policies in protected areas.

Keywords: *Willingness to Pay (WTP), Natural resource management, Protected areas, Environmental valuation*

JEL Codes: Q51; Q56; Q57; Q58.

How Climate Change is Addressed in the Faustmann Forest Economics Model: A brief review

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Abstract

This paper examines how climate change is addressed within the Faustmann Forest Economics framework to uncover the main takeaways regarding Optimal Rotation and Land Expectation Value (LEV). Three themes emerge. Mechanisms: climate change is mainly addressed through carbon accounting (life-cycle storage and release, direct and indirect emissions, multiple carbon pools), modeling the risk of climate-related disturbances (fire, storms, insects), and through the valuation of productivity changes and species shifts based on LEV. Optimal Rotation: when risk intensifies with stand age, rotations tend to shorten, whereas the availability of financial instruments such as insurance schemes offsets that effect. Carbon payment schemes generally lengthen rotations, but explicitly accounting for the albedo effect leads to shorter rotations relative to policies that rely solely on carbon emissions and accounting. Stochastic price modeling often leads to earlier harvests and higher LEVs than traditional Faustmann modeling. Replacement of tree species to battle the effects of climate change and increase forest resilience is associated with declines in LEV, and extensive-margin adaptation (replanting more suitable species) typically dominates marginal tweaks to rotation length. Policy: since forest valuation hinges on accounting rules, instrument design (taxation, subsidies, carbon penalties, insurance), and the degree of price uncertainty, climate related policies should align carbon incentives while addressing multi-hazard risk to be effective in addressing climate change through the economic management of forests. Overall, the Faustmann model remains the main vehicle for climate-relevant economic forest management, but recommendations are instrument-sensitive: a carbon-only lens tends to delay harvest, whereas adding age-dependent risk can reverse that result.

Keywords: *Faustmann model; climate change; optimal rotation; land expectation value (LEV); carbon accounting.*

JEL Codes: Q23; Q51; Q54; Q56; Q57.

Quantile estimation of CO_2 marginal abatement cost under heterogeneous emission-generating technologies

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Abstract

Marginal abatement cost (MAC) is a critical metric for designing efficient climate policies. However, the reliability of MAC estimates is challenged by heterogeneous inefficiencies, the choice of emission-generating technologies, and the presence of extreme data. To address these issues, the first methodological contribution of this paper is to develop three sign-constrained convex nonparametric least squares models to represent by-production, joint disposability, and weak G-disposability technologies. The second contribution is to extend the analysis to quantile frontiers by proposing a convex expectile regression approach that explicitly incorporates inefficiency in characterizing emission-generating technologies. The third contribution is to investigate how alternative technology choices affect MAC estimates, drawing on empirical evidence from U.S. coal-fired power plants in 2022 and complementary Monte Carlo simulations.

Keywords: *Data envelopment analysis, Marginal abatement cost, Quantile estimation, Monte Carlo simulation*

JEL Codes: O44; O47; O52; Q43; Q56.

Sustainable Practices and Climate Change Adaptation in Olive Farming: Insights from Producers in Aetolia–Acarnania, Greece

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Abstract

Olive cultivation remains a cornerstone of the rural economy and cultural heritage in the Regional Unit of Aetolia–Acarnania, western Greece. However, the sector faces growing challenges from climate change, market volatility, and technological transformation. This study investigates how olive farmers perceive and respond to these pressures, focusing on their adaptive behavior, management practices, and readiness to transition toward sustainable production systems. Primary data were collected through 402 structured questionnaires administered in person between November 2024 and February 2025 across multiple towns and villages in Aetolia–Acarnania. The findings reveal significant heterogeneity among producers in their understanding of climate risks and their capacity to respond effectively. Economic uncertainty, limited access to information and training, and the persistence of traditional cultivation practices emerge as major barriers to adaptation. Nevertheless, there is increasing recognition of the need for environmentally responsible and economically viable approaches to olive production. The results highlight the importance of integrated policy measures that strengthen farmers' adaptive capacity through targeted education, innovation diffusion, and institutional support. Promoting the adoption of sustainable farming practices and the use of new technologies can enhance resilience and ensure the long-term viability of olive cultivation as both an economic activity and a driver of sustainable rural development in Mediterranean regions.

Keywords: olive cultivation; sustainable agriculture; climate change; ecosystem resilience; environmental policy; rural sustainability; Greece.

JEL Codes: Q01 ,Q12, Q15, Q54, Q13

Session 3.

Climate Change: Natural Disasters & Environmental Hazards

Climate Change, Natural Disasters, and Growth Dynamics in Latin America: A Panel Data Analysis

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Abstract

The growing occurrence and severity of climate-related natural disasters and climate change have intensified concerns about their long-term implications for economic stability, particularly in developing and middle-income regions such as Latin America. This research explores the dynamic interplay between climate-induced disasters and economic growth, with particular attention to how trade openness and capital formation shape this relationship. Drawing on a balanced panel dataset covering nine Latin American economies over the period 1980–2024, the study integrates short- and long-run econometric techniques to provide a nuanced understanding of how natural shocks affect macroeconomic performance. The empirical approach employs Fixed Effects (FE), Random Effects (RE), and Driscoll–Kraay (DK) estimators to address potential issues of unobserved heterogeneity, serial correlation, and cross-sectional dependence. To examine distributional heterogeneity across income levels, Quantile Regression is applied, while Panel Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) estimations are used to assess long-term relationships. The dependent variable is real GDP per capita, with explanatory variables including capital formation, trade openness, urbanization, agricultural and service value added, and measures of climate-related disaster frequency and severity. The results consistently indicate that capital formation and trade openness are powerful drivers of growth, reinforcing the importance of domestic investment and international integration for sustained development. In contrast, urbanization and agricultural value added are negatively associated with growth, implying that unregulated urban expansion and overreliance on primary sectors may hinder productivity. Climate-related disasters exert a persistent and significant negative effect, highlighting their disruptive impact on infrastructure, output, and human capital. Meanwhile, the services sector supports short-term recovery and stability, though its contribution appears statistically insignificant in long-term estimations. A central finding is the positive and significant interaction between disasters and trade openness, suggesting that countries more connected to global markets experience smaller economic losses from climate shocks. This moderating effect is robust across models. Results from the Quantile Regressions reveal that the resilience benefits of trade and investment are more substantial among higher-income economies, where institutional and structural capacity is greater. Long-run models (FMOLS and DOLS) reinforce these patterns, yielding exceptionally high explanatory power. In conclusion, the evidence demonstrates that trade integration and capital accumulation not only stimulate economic growth but also enhance resilience to climate-related disruptions. The findings highlight the need for policies that promote regional trade cooperation, investment in climate-resilient infrastructure, and sustainable urban and agricultural management to strengthen long-term development and adaptive capacity in Latin America.

Keywords: *Climate change; Natural disasters; Economic growth; Trade openness; Capital formation; Latin America; Panel data*

JEL Codes: Q54, F43, O44, C33, O54

Sense-Making and Resilience Perspectives of Austrian Micro and Small Enterprises Towards Flooding: A Qualitative Study

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Abstract
Climate change increases the frequency and intensity of extreme weather events, such as floods. Micro and small enterprises (MSEs) are particularly vulnerable to such events due to limited resources and low preparedness. This study explores the attitudes of Austrian MSE owners toward flood risk and challenges they face in strengthening organizational resilience after the severe flood of September 2024 that occurred in Austria. Twelve semi-structured interviews were conducted with MSE owners from flood-affected areas. Data were analysed through two coding cycles, combining open and deductive coding based on Protection Motivation Theory (threat and coping appraisals). Findings highlight critical barriers to resilience and reveal varying levels of learning from past flood experience, leading to a typology of flood risk attitudes. Findings also suggest that MSEs emphasise physical preparedness over organisational and strategic planning. The study recommends that local authorities and business associations promote peer-learning, experience-sharing, and tailored advisory services to assist enterprises design integrated resilience strategies extending beyond physical protection.

Keywords: *Flooding; Micro- and Small Enterprises; Climate Change Adaptation; Resilience; Qualitative Study; Austria.*

JEL Codes: Q54; Q56; L26; D22; O13.

Extreme weather and individual preferences in rural Thailand and Vietnam

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Abstract

We investigate how cumulative exposure to extreme weather shapes individual preferences. Leveraging longitudinal survey (2016–2024) from rural Vietnam and Thailand, we investigate the experience effects on patience, risk aversion, and non-financial risk attitudes. Exploiting the between- and within-individual variations of disaster experiences with Seemingly Unrelated Regressions, we uncover four findings. First, the cumulative experience of droughts, floods, and landslides can cause significant impacts in risk and time preferences with the direction depending on the country. The landslides leave the strongest effects among all events. Furthermore, a cumulative disaster experience characterized by more frequent sufferings affect individual preferences the most. We reveal a striking frequency-intensity paradox where moderate but more frequent disasters systematically produce larger behavioral changes than severe rare disasters. Third, extreme weather shocks amplify existing gender and ethnic inequalities and highlight how weaker institutions in Vietnam compound vulnerabilities. However, the males' effects are more persistent than those of female samples after controlling for the local market and health shocks. Disaster risk management policies should prioritize building resilience against moderate, frequent shocks while implementing targeted social protection mechanisms, as the behavioral impacts of frequent moderate disasters exceed those of rare severe events and disproportionately affect the most vulnerable communities.

Keywords: *Climate change; risk aversion; patience; seemingly unrelated regression; gender effect.*

JEL Codes: D12; D81; J16; Q54.

(C)yber (D)igital (R)isks: Revising the Framework Modern Threats Landscape for Environmental Hazards

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Abstract

Conventional frameworks for disaster risk reduction have traditionally been structured around four foundational components: hazard, exposure, vulnerability, and capacity. However, the increasing digitalization and interconnectivity of critical infrastructure systems have introduced a novel and systemic category of risk that extends beyond these established dimensions. This paper advances the argument for recognizing *digital risk* as a fifth pillar within the risk assessment paradigm, given the significant implications of cyber threats—particularly those involving remote access attacks—on physical infrastructure and environmental stability. Malicious intrusions into essential systems such as power grids, water treatment plants, and industrial control networks have demonstrated a growing capacity to initiate or amplify environmental crises. Unauthorized digital access can, for example, result in the intentional discharge of hazardous substances, compromise safety mechanisms, or lead to the malfunction of containment systems—thereby generating cascading impacts that surpass the digital domain. This study examines the converging trajectories of cybersecurity vulnerabilities and environmental hazards, positing that digital technologies must be conceptualized not solely as instruments of resilience but also as emergent sources of systemic risk. A revised risk assessment framework is proposed, incorporating digital risk as an integral component alongside the conventional four pillars, thereby providing a more comprehensive model to address the complexities of modern threat landscapes. Furthermore, the paper presents a set of policy and technical strategies for embedding cybersecurity into disaster risk governance, with particular attention to early warning systems, intersectoral coordination, and the development of digital competency. Recognizing digital risk as a distinct and critical pillar is imperative for constructing holistic, adaptive approaches to the protection of critical infrastructure and the advancement of environmental security.

Keywords: *Digital Risks, Technology-pillar, Risk Assessment, Environmental Hazards, Framework*

JEL Codes: D81; O13; O33; P18; Q54

Session 4.

Nature-based Solutions, Innovation & Resilience

Eco-process innovation: a “win win” situation or “when you have lemons make lemonade”? The moderating role of marketing innovation.

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Abstract
This study advances the eco-innovation literature by analysing the distinct effects of eco-process innovation components, specifically end-of-the-pipe (EPT) and resource-efficient technologies (RET), on firms’ innovation performance and whether marketing innovation moderates these effects. We analyse data from 7,660 product innovator firms across eight European countries using a Conditional Mixed Process (CMP) approach. The empirical results suggest that eco-process innovation does not have a uniform impact on innovation outcomes and that marketing innovation can transform compliance-driven environmental efforts into strategic advantages. EPT adoption has a negative impact on innovation performance, whereas RET adoption exerts a positive effect. Marketing innovation emerges as a key moderating factor, positively moderating the relationship between EPT technologies and innovation performance. On the contrary, marketing innovation does not exert a significant moderating impact on firms’ innovation performance in the case of RET.

Keywords: *Eco-innovation; green technology; innovation performance; marketing innovation; CMP*

JEL Codes: O31, Q55, M31

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Sustaining Environmental Resilience: A Stackelberg Game

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Abstract

This paper develops a dynamic Stackelberg game between a social planner and an extracting firm to study the regulation of resource extraction under alternative environmental dynamics. The planner acts as leader by setting extraction quotas, while the firm, as follower, chooses extraction effort in response depending on the allowed quantity. The analysis is conducted under both exponential and logistic regeneration functions, with open-loop and feedback strategies considered. The results show that in the exponential growth case, open-loop equilibria yield unstable steady states, and stability can only be achieved under feedback control with sufficiently strong environmental resources stock-sensitive responses. In the logistic growth case, natural carrying capacity does not guarantee stability; instead, saddle-path equilibria emerge, implying sensitivity to initial conditions and discounting. Across all settings, the planner's quotas discipline extraction effort, but sustainability remains fragile. The findings highlight the limits of regulatory control, the importance of feedback mechanisms, and the necessity of precautionary policy design in achieving long-run resource sustainability.

Keywords: *Differential games, Environmental degradation, Exponential growth, Logistic growth, Sustainable growth, Stackelberg game.*

JEL Codes: C61, C72, Q58, Q52

EUNICoast

Abstract

EUNICoast is an innovative European University Alliance dedicated to addressing the unique challenges and harnessing the opportunities of Europe's island and coastal regions. Integrating sustainability, education, research, innovation, and community engagement, EUNICoast aims to highlight the human and dynamic dimension of ports and islands, two distinct yet deeply interconnected elements of Europe's identity and development. Bringing together 12 member universities and 88 associated partners, the Alliance promotes a multicultural, multilingual, and inclusive environment for learning, research, and innovation, open to the world. Its mission is to strengthen the collective capacity of universities to effectively respond to the social, economic, and environmental challenges faced by coastal and island communities. EUNICoast envisions a future where ports act as hubs of innovation and cultural exchange, and islands serve as catalysts for sustainable development. Through collaboration, knowledge exchange, and joint initiatives, the Alliance seeks to place universities at the core of Europe's Blue Economy, empowering a new generation of conscious, engaged, and globally minded citizens committed to sustainability and resilience.

Conceptualizing the Symbiosis Maturity for Nature-based Solutions: A SWOT-driven framework across technical, environmental, management and institutional domains

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Abstract

Nature-based solutions (NBS) are increasingly deployed to deliver ecological, social, and economic co-benefits under the scopes of circular economy transition, one health integration, and sustainable development goals (SDGs) achievement. However, there is a lack of a holistic framework that mutually reinforces these solutions across systems that remain limited. This paper introduces the Symbiosis Maturity Level (SML) for NBS and proposes a SWOT-driven assessment framework spanning four development domains: technical (TML), environmental (EML), management (MML), and institutional (IML). The relationship between the concepts is not made explicit in literature, therefore, the novelty is the provision of the four maturity-level terms, addressing this literature gap and aims to provide conceptual clarity by distinguishing the terms and synthesising the different types of relationships between them. The objective is the application of the SWOT analysis in order to inspect the strengths, weaknesses, opportunities, and threats within each domain and to highlight the cross-domain interdependencies. The overview covers 79 publications in the period 2010–2024 from Scopus, Web of Science, and Google Scholar. The resulting SML provides a transparent way to benchmark maturity, reveal bottlenecks, and prioritize actions across NBS portfolios. Ultimately, the reframing of NBS evaluation through a symbiosis framework offers a practical pathway for policymakers, practitioners, and researchers to guide decisions toward more robust, durable, and scalable NBS.

Keywords: *nature-based solutions; SWOT; maturity modelling; strategic planning; governance; evidence synthesis; symbiosis framework.*

JEL Codes: Q01, Q55; Q57; Q58

Session 5.

Circular Economy: Water & Waste Management

Water management practices in Ancient Greece

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Abstract

This paper analyzes the water management practices that were introduced in Ancient Greece with emphasis in Classical Athens (508 – 323 BCE). It argues that their success should be attributed to two main factors that functioned in combination: investing on water management infrastructure and introducing effective water management institutions. Infrastructure included extensive public works such as the building of public wells, fountains, springs, aqueducts and cisterns, as well as the building of an underground water supply network, and the building of a sewage underground network for wastewater management. Institutions included the introduction of a series of public magistrates who were assigned to implement the city-states' water management strategy. Their duties are analyzed in detail in the paper. The paper finally discusses if and how water management practices in Ancient Greece at the Classical times may be seen as an inspiration for modern societies on related environmental issues.

Keywords: *Ancient Greece, Classical Athens; public infrastructure, public goods; water management institutions; environmental sociology*

JEL Codes: H41; H76; K20; N43; N53; Q28, Q58

Join the dots: A rapid temporal appraisal of the bioeconomy in NUTS II regions in Greece

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Abstract

The present paper aims to present for the first time a temporal bioeconomy assessment in the 13 NUTS II regions in Greece. The research builds upon Maroulis et al. (2025) and Kalimeris et al. (forthcoming). There the main objective was to assess and promote the transition to bioeconomy on a regional scale by analysing EU regions (NUTS II Level) with a group of selected bio-indicators with the latest available data. Primarily based on the results of BIO2REG project, the paper aspires to put the dimension of time into the evaluation of bioeconomy performance and provide a more comprehensive application of the bioeconomy on a regional level. Using a set of 26 pre-selected bioeconomy related indicators, it will be investigated how Greek NUTS II regions have performed during the period 2010-2022. This temporal assessment will enhance the credibility of the bioeconomy assessment framework of our existing work and will constitute the basis of expanding the temporal bioeconomy assessment to other EU Member States. Furthermore, it aspires to provide the first blueprint for revealing the model bioeconomy regions and the potential EU-wide pathways to promote regional bioeconomy.

Keywords: Bioeconomy; regional development; circular bioeconomy; sustainable development

JEL Codes: Q57; Q56; Q43; Q2

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Knowledge, aspects and habits of the residents of Zakynthos, regarding solid waste recycling in the island

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Abstract

Zakynthos Island has suffered severely for the last 18 years by the inefficient waste management, especially during peak seasons. The massive tourism growth since the decade of 1990, combined with the lack of timely planning, have caused serious environmental deterioration, irreversible in certain cases, whereas more often than not since 2015 garbage heaps have created the conditions for potential disease outbreak. The embarrassing photos picturing bins overflowing with garbage have repeatedly travelled around the world. Trying to capture the aspects of the residents of Zakynthos concerning the island's hottest issue, a questionnaire was designed, and distributed through the online version of the local newspaper "Imera" (www.imerazante.gr) and personal contacts. The answers gathered between August 20 and September 20, 2024 were processed and revealed interesting results. In the context of introducing new measures and policies, it is of critical importance to depict the current situation as accurately as possible and take into consideration the conclusions inferred by statistical analysis.

Keywords: *solid waste, recycling, local authority.*

JEL Codes: Q53; Q58.

Toward sustainable Waste for Electrical and Engineering Equipment indicators: Addressing missing values with Coverage mapping, Imputation and Validation

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Abstract

This paper maps data coverage and the morphology of missing values across 13 WEEE management operations for EU27 in 2005-2023. Coverage is profiled for each country and operation, and gaps are characterized by their position at the beginning or end of the series and by the longest interior run, which records timing and persistence. A transparent feasibility scheme converts these diagnostics into rules for action. Based on predefined criteria, five operations are selected for imputation: Products put on the market (MKT), Waste collected (COL), Recovery (RCV), Recycling and preparing for reuse (RCY_PRP_REU) and Waste treatment (TRT). Imputation follows a conservative, gap aware protocol. Linear interior interpolation with slope caps based on local first differences is applied. When needed, linear edge extension with geometric damping is performed, a zero floor keeps all imputed values including edge extensions non-negative and a complete audit trail is maintained to preserve the temporal structure. The resulting national series are aggregated to EU27 and are then validated against official Eurostat indicators, including Gross Domestic Product (GDP), Household final consumption expenditure (HFCE), Harmonized index of consumer prices (HICP), Retail trade volume index (RTV) and Population (POP). These external datasets provide the reference needed to confirm that the imputed values follow the wider European trends and remain coherent with related operations. Internal checks further assess cross operation consistency. The outcome is a reproducible pipeline that improves continuity without imposing artificial smoothing and delivers coherent time series ready for downstream modelling and comparative analysis.

Keywords: WEEE, missing values, imputation, external validation, Eurostat

JEL Codes: Q53; C81; C82; E01; C43.

Session 6.

Digitization in Sustainable Tourism

The Digitization of Archaeological Museums as a tool for Sustainable Tourism and Local Development: Evidence from Central Macedonia Greece

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Abstract

The current paper examines the role and impact of the digitization in archaeological museums, focusing on the developments that have been occurred in the case of Central Macedonia, Greece. The research explores how digital technologies such as multimedia applications, virtual and augmented reality, are being used to improve visitor experience, extend accessibility, and encourage inclusion, especially for people with disabilities. By interviewing local museum representatives and analyzing current practices, the study identifies both the opportunities and the challenges of adopting digital strategies in cultural heritage management. The findings indicate that digitization can contribute to sustainable tourism by attracting a wider audience, increasing visitor numbers, and increasing the involvement of museums in the local economy. Furthermore, the paper emphasizes the importance of the role of digital transformation in supporting environmental and cultural policy tools that can support a long-term local development and sustainable cultural tourism. This information provides useful information for local authorities, tourism and cultural professionals and whomever might be interested in embracing innovation for cultural and economic development.

Keywords: *Sustainable Cultural Tourism, Digital Innovation, Regional Development, Environmental Sustainability, Multimedia Applications*

JEL Codes: Z32; Q55; R11; Q56; L82

Integrating multi-source data and visualization of heterogeneous time-series for lakes: NDWI surface, ERA5 precipitation, level and fishery production

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Abstract

The aim of this paper is to present a reproducible workflow for the organization and visualization of heterogeneous, multi-purpose environmental data, presented for Lake Doirani for the period 2011–2023. Satellite images from Landsat 7/8 (2011–2017) and Sentinel-2 (2018–2023) satellites are processed using the Python programming language to calculate the Normalized Difference Water Index (NDWI) within a small region of interest for the lake, yielding a monthly water extent time series. Monthly precipitation totals are derived from the ERA5 reanalysis after a small spatial subset around the lake. We have aggregated lake level and annual fishery production data and lake area and rainfall data and created a final master value table. We have time-aligned them by creating time series data with an annual step and produce an annual overview of four axes (lake area, lake level, local rainfall, fishery production). Preliminary patterns show that drought years and reduced lake area/level generally co-exist with lower fishery production, with an indicative lag of 0-1 year. These relationships are exploratory and are not stated as causal. The workflow emphasizes open data, transparent processing and portability: by changing only the area of interest and data sources, the same process is applied to other lakes. The contribution is methodological, how to structure, aggregate and present mixed environmental time series to support lake monitoring and decision-making.

Keywords: *Sustainable Development; Data Collection and Data Estimation Methodology; Computer Programs: General; Computational Techniques; Fishery; Large Data Sets: Modeling and Analysis.*

JEL Codes: Q01; C80; C63; Q22; C55

Sustainability in Tourism in Greece using e-tourism: the case of Ecohotels and Expedia online platforms in e-Reputation

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Abstract

The present study investigates the correlation between sustainable certification and the e-reputation of hotels, acknowledging the critical importance of sustainable tourism and the pivotal role of e-Tourism in shaping consumer choices. While sustainability has become a central criterion for the travel industry, the quantitative impact of certifications on online competitiveness remains unclear. To address this research gap, the study adopts a quantitative comparative methodology, analyzing data from two distinct platforms: Ecohotels.com and Expedia. Specifically, the research compares the sustainability scores from Ecohotels, a specialized platform for ecological accommodations, with the ranking and overall customer sustainability rating provided by Expedia, one of the largest online travel agencies. The analysis aims to determine whether hotels with higher environmental certifications achieve improved online visibility and increased positive evaluation. The anticipated findings will contribute substantially to hotel strategic management, providing evidence-based insights into the value of integrating and communicating sustainable practices within the digital environment.

Keywords: *Sustainable Tourism, e-Reputation, e-Tourism, Sustainability Certifications*

JEL Codes: L82, L86, Q56, Z32, Z33

The Significance of Photography and Video User Generated and Shared Content in Mountainous Sustainable Tourism: The Case of Mount Olympus National Park

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Abstract

This study investigates the critical role of user-generated photography and video content in advancing the sustainable tourism objectives of Mount Olympus National Park. Through a quantitative survey among the park visitors, the research aimed to establish an evidence base for integrating visual media into future governance and promotion strategies. The results demonstrated that around three quarters of the visitors engage in photo or video activities. A highly significant and moderately strong positive correlation was identified between taking photos and sharing them on social media. This suggests, these are interdependent behaviours that can be leveraged for promotion. The findings conclude that visitors visual content creation in social media offer an effective and cost-free method to promote visitation in mountainous regions. The research ultimately recommends creating designated "Instagramable spots" on protected area paths to manage increased visitor flow and mitigate environmental pressures from uncontrolled dispersion.

Keywords: *Photography, Video, Social Media Content Creation, Sustainable Tourism, Mount Olympus, National Park*

JEL Codes: Q20, Q26, Q28

Session 7.

Environmental Pollution:
Urban, Health & Industrial Dimensions

Stairways to Heaven for European Industries: Multi-driving paths for CO_2 emissions generation

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Abstract

The European Commission (EC) acknowledges that industries play a significant role in global greenhouse gas emissions. Given the growing environmental and climate challenges, both the EC and national governments have implemented a range of environmental policy tools, such as laws and regulations, aimed at fostering innovative approaches to combat pollution and reduce CO_2 emissions. However, designing an effective policy package remains complex, as it must be customized to fit different social, economic, and technological environments. This study uses the Fuzzy-Set Qualitative Comparative Analysis (fsQCA) method to explore the intricate and interconnected factors influencing CO_2 emissions across European countries. The analysis examines the interaction between policy instruments and various social/economic contexts. By analyzing data from 2008 to 2020 across eleven manufacturing industries in 29 European countries, the study identifies several causal configurations that contribute to higher CO_2 emissions, including trade, energy mix, environmental taxes, and economic growth. The findings emphasize the critical role of appropriate policy, economic, energy, and technological tools and reveal that there is no single pathway to achieving sustainability. This research not only enhances our understanding of pollution dynamics but also offers valuable insights for developing effective policies in diverse social contexts.

Keywords: *European industries; Carbon emissions' determinants; Decoupling groups; Fuzzy set qualitative comparative analysis*

JEL Codes: Q53, Q56, L60, O13

Regulation schemes for pollutants. Multiple steady states and pollution traps

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Abstract

This paper develops a dynamic differential game between polluting firms and a regulating government to analyze the interaction between emissions, abatement, and taxation in environmental policy. The pollution stock evolves according to firms' emissions and the government's abatement effort, while payoffs reflect production benefits, taxation, and environmental damages. We characterize equilibrium strategies under both Nash and Stackelberg frameworks. In the Nash game, simultaneous decision-making leads to nonlinear dynamics that can generate multiple equilibria, including stable clean states and high-pollution traps. Comparative statics reveal that higher taxation efficiency and stronger abatement reduce emissions and enhance stability, but insufficient policy effort can destabilize the system. Under Stackelberg competition, outcomes crucially depend on leadership. When the government leads, it internalizes polluters' reactions, implementing stronger policies that eliminate high-pollution equilibria and stabilize the system. When polluters lead, firms exploit first-mover advantage to secure higher emissions, weakening policy effectiveness and destabilizing pollution dynamics. The results highlight the importance of credible government leadership in steering the economy away from environmental traps and towards sustainable steady states.

Keywords: *Nash differential game, Stackelberg differential game, Pollution traps, First mover advantage, taxation efficiency.*

JEL Codes: C61, C72, Q58, Q52

Urban centers, Traffic, Atmospheric Pollution and Associated Health Risks: Evidence from Africa

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Abstract

African cities are experiencing a rapid urbanization and sustained economic growth. The increasing demand for transportation and mobility is bringing forth significant challenges: undeveloped transport and mobility infrastructure, low roads density, reduced car fleet, non-integrated transport modes, lack of regulation and emissions control. In urban centers, traffic emits substances harmful to human health which should be controlled and monitored. Mixtures of gases (NOx, CO, SO_2…) and particles are emitted from different sources (engine combustion, fuel evaporation, tires, clutch, and wear degradation, etc.). Exposure to high pollutants concentration can be detrimental to human health. In recent years, it has been demonstrated that air pollution is associated with many diseases such as diabetes, stroke, cancer, hypertension, respiratory and pulmonary diseases such as asthma, etc. Short-term exposure can irritate eyes, nose, and throat, while long-term exposure is more serious, causing heart and lung diseases, reduced lung function, low birth outcome, and premature death. This paper is a comprehensive overview of traffic-related air pollution in African urban centers, key driving factors and associated health risks. Emissions concentrations are higher than in developed countries and well above threshold values. Fine particulate matter concentration varies across cites but remains high: 32-79 $\mu g.m^{-3}$ in Thiès (Senegal), 82-113 in Douala (Cameroon), 100-500 in Cotonou (Benin), 33-328 in Addis Ababa (Ethiopia). Health quotient (HQ) derived from these values, are high (>1), demonstrating high risks of developing non-carcinogenic diseases. Potential solutions and strategies to address this pressing issue (focusing on sustainable transportation practices, emission control technologies, and urban planning initiatives) are highlighted. The complex nature of the traffic-induced air pollution calls for more research and synergized actions by stakeholders.

Keywords: *African cities; air pollution; clean fuels; health risks.*

JEL Codes: I15; O29; R00

A Marxist analysis of the Relation Between CO_2 Emissions Growth and Sectoral Profitability

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Abstract

The relationship between ecological degradation and capitalist accumulation has been a longstanding focus within critical political economy. In this paper, we examine this dynamic through a panel analysis of 35 countries and 24 economic sectors over the period 2000–2014. Employing a Marxist analytical framework, our findings indicate a positive association between greenhouse gas emissions and sectoral profitability, particularly within industries characterized by low technological complexity. These sectors—predominantly located in the Global South—tend to be labour-intensive, exhibit low labour productivity, possess a low organic composition of capital, and generate limited value added. Moreover, our analysis suggests that the structural asymmetries between the Global North and the Global South, or between the core and the periphery, are not only reproduced but further deepened, both in ecological and economic terms.

Keywords: *Ecological degradation; capitalism; global south; sectoral analysis*

JEL Codes: P18, L6

The Pollution levels in Athens and Salonica: An Environmental Analysis Approach

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Abstract

The target of this paper is to describe briefly the existed statistical analysis on the existed main pollutants in Athens and Salonica, developed under two different lines of thought; (i) Probability oriented Data Analysis and (ii) Statistical Models comparing the pollution. Our target is to improve the study on the pollution between the two main cities, [1]. [2], in Greece were almost the 70% of the population is living and propose the appropriate methods and strategies, under the uncertainty principle developed in [3].

Keywords: *pollution; statistical analysis; probability-oriented data analysis*

JEL Codes: Q53; Q58; Q52

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Session 8.

Novelties in Environmental Valuation under Uncertainty

Environmental Uncertainty Effects on Money Investments: Strengthening or Weakening Resilience to Inflation?

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Abstract
This study investigates how key kinds of money, such as metallic (commodity) money and international fiat currencies, interact with environmental uncertainty across market regimes. We generate extended joint connectedness (EJC), averaged dynamic connectedness, and network connectedness at lower (bear), middle (normal), and upper (bull) quantiles using daily data from January 22, 2020, to January 31, 2025, using a Quantile-VAR (QVAR) methodology. In general, fiat currencies have a stronger correlation with environmental uncertainty than do metals used for monetary reasons, and systemwide connectivity increases in tail regimes (bull and bear). Under current conditions, U.S. climate policy and environmental risk are the main exceptions to the rule that climate risks normally operate as net absorbers of systemic risk. The U.S. dollar is the primary net shock contributor in fiat markets. Iron ore is the most potent net stabilizer among base metals, while gold, silver, and platinum act as safe havens (net absorbers) in bear markets and change to net transmitters in bull markets. These findings emphasize the strategic significance of inflation-resilient liquidity for investors and policymakers facing climate-related financial stress, as well as the dual role of precious metals—as channels for risk transmission during periods of optimism and as inflation shields during downturns.

Keywords: *Environmental Uncertainty; Fiat Currencies; Precious Metals; Quantile-VAR (QVAR); Dynamic Interplay; Market Risk.*

JEL Codes: E52, E58, G15, O44, Q54, Q58.

Conflict of interest: There is no conflict of interest for the authors
Data availability statement: All data are available upon request

Reinstatement of Rail Transport Between Strymon and Alexandroupolis – an Environmental, Financial, and Economic Evaluation

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Abstract

The rail line Strymon – Alexandroupolis has been out of circulation since the mid-2010s due to poor maintenance, which led to a severe degradation of its quality. The Greek Railways had a study conducted to reinstate traffic through heavy maintenance and targeted construction works. These works aimed to replace or upgrade specific structures (culverts, bridges, tunnels) and stations to meet the requirements for interoperability through a public-private partnership (PPP), a scheme which did not go forward. Other options for the reinstatement of traffic include alignment changes and different funding schemes, such as public financing or a concession. The present study examines different engineering and financing options, using advanced Machine Learning forecasting models for passenger and freight traffic, the recently published Greek Finance Ministry's guide to transport project feasibility studies, and relevant European Union guidelines to produce environmental, financial, and economic evaluation metrics.

Keywords: *Rail Transport, Electrification, Forecasting, Machine Learning*

JEL Codes: R41, R48, Q41, Q42

Digital Self-Assessment of Accommodation Vulnerability to Climate Change Using Artificial Intelligence Tools

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Abstract

This paper explores the need for the development and implementation of an innovative digital self-assessment tool that evaluates the vulnerability of tourism enterprises to climate change by utilizing Artificial Intelligence (AI). The climate crisis exerts increasing pressure on the tourism sector, particularly in coastal and island regions where tourism establishments are exposed to risks such as rising sea levels, extreme weather events, and shifts in tourism demand. Despite the severity of these impacts, small and medium-sized tourism enterprises (SMEs) still lack access to affordable, flexible, and customized risk management tools. The use of AI can accelerate the creation of such solutions, providing tailored vulnerability assessments and adaptation scenarios. Moreover, the adoption of a dynamic vulnerability framework allows for a deeper understanding of the ever-changing nature of climate risks and their effects on tourism. The ClimaSafe project addresses this challenge by developing a web-based tool that enables the self-assessment of climate vulnerability while simultaneously offering personalized adaptation recommendations. The methodological approach includes: (a) a systematic literature review of international tools, (b) pilot implementation in at least 15 accommodation units with different characteristics, and (c) analysis of existing systems such as Climate ADAPT and CRiSTAL. The tool combines the power of AI with a participatory design approach and dynamic micro-level risk assessment. Such tools can serve not only as risk management mechanisms but also as educational platforms that strengthen strategic adaptive capacity and promote a culture of sustainability in the tourism sector. The adoption of these solutions contributes to the development of organizational skills related to adaptation, while simultaneously fostering the active engagement of employees and managers in knowledge creation and the implementation of sustainable strategies. ClimaSafe is proposed as a preventive solution, strategically aligned with the principles of the green transition, resilience, and operational sustainability, offering a competitive advantage to tourism enterprises that adopt it.

Keywords: *Climate change, vulnerability self-assessment tool, climate adaptation, sustainable tourism, climate resilience, risk management, operational sustainability*

JEL Codes: Q54, Q56, L83, Q01

Impact of Artificial Intelligence Implementation on Sustainability in Colombo's Business Process Outsourcing Sector in Sri Lanka

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Abstract

The processes of Artificial Intelligence integration are evolving at a fast pace and are rapidly changing business models across industries and organizational functions. This study investigates the impact of Artificial Intelligence (AI) implementation on sustainability in Colombo's Business Process Outsourcing (BPO) sector. The research investigates the following four dimensions: energy efficiency, adaptability of workforce and compliance with the sustainability standards, operational efficiency. The study uses a mixed methods approach including survey, a statistical analysis and shows that AI implementation has a huge impact on energy efficiency and operational efficiency that will positively influence one's overall sustainability. Although adaptation of the workforce has a negative relationship with sustainability, this demonstrates the need for comprehensive reskilling and changing management. There is no significant difference in overall sustainability outcome due to compliance with sustainability standards. There are several key contributions that the study makes to the field. First, it offers empirical proof of how multifaceted the impacts AI has on sustainability in an emerging market BPO environment, which contributes to that literature. It is also an illustration of opportunities and challenges associated with the use of AI for sustainable development and is a view of the use of AI. It finally presents practical insights for the implementation of AI in BPO firms, policymakers, and other stakeholders design to counteract the negative aspects of AI use. What these findings imply is that by using AI, both the economic, social and environmental sustainability of the BPO sector could be boosted, if there is a balanced approach towards technological impact and those of human factors in achieving such results.

Keywords: Artificial Intelligence, Business Process Outsourcing, Sustainability, Energy Efficiency, Workforce Adaptability, Operational Efficiency

JEL Codes: O33, L86, Q01, Q41, J24, D24

Session 9.

Climate Anxiety & Ecological Awareness

The influence of motivational goal frames and coping strategies on climate anxiety

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Abstract

Crossing critical planetary boundaries underscores the urgent need to accelerate global action toward carbon neutrality, climate adaptation, and implementation of SDGs. As individuals serve as micro-level agents of change, understanding their cognitive, behavioral and emotional responses to climate-related threats is essential for addressing climate crisis. In response, the present research explores how diverse goal frames that motivate environmental decision-making relate to climate change coping strategies and climate anxiety. Using a cross-sectional design, a convenience sample of 802 participants completed online self-reported questionnaires. Data analysis relied on PLS-SEM methodology, including validity and reliability assessments of the proposed model, test for common method bias, evaluation of structural parameters, and robustness checks for linearity assumptions, endogeneity, and unobserved heterogeneity. Bootstrapping results confirmed the construct validity and reliability of the measurement model, with path coefficients supporting all research hypotheses. Robustness checks revealed endogeneity concerns which were addressed by estimating a Gaussian-copula adjusted model. Findings indicate that de-emphasizing coping strategies are positively influenced by gain goal frame but negatively associated with hedonic motivation. Normative goal frame strongly affects both meaning and problem-focused coping. De-emphasizing and problem-oriented coping strategies are significant predictors of climate anxiety, whereas meaning-focused coping mechanisms inversely impact it. The results offer practical implications for policymakers to integrate psychological mechanisms into environmental policy design, promoting adaptive responses to climate change and strengthening societal resilience.

Keywords: *Goal Framing Theory; Climate change; Coping; Climate Anxiety; PLS-SEM.*

JEL Codes: A14; Q00; Q51; Q56; Q5; Q58, Q59.

The Role of Environmental Education in Promoting Sustainable Development and Ecological Awareness: An Economic & Social Approach

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Abstract

Achieving sustainable development requires profound social transformations based on environmental education and the strengthening of ecological awareness and sensitivity. This paper examines the role of environmental education as a catalyst for the transition to a sustainable economic and social model, focusing on the interactions between citizens' knowledge, values, and behavior. Through a qualitative and conceptual analysis of policy frameworks and environmental education programs in Greece and internationally, the study explores the mechanisms through which education enhances social and environmental resilience. Particular emphasis is placed on its contribution to the rational management of natural resources and the integration of the Sustainable Development Goals (SDGs) into the educational process. The findings highlight that the institutional strengthening of environmental education can serve as a lever of ecological responsibility and social cohesion, significantly contributing to the shaping of a long-term sustainable development trajectory.

Keywords: *Environmental Education, Sustainable Development, Ecological Awareness, Social Resilience, Natural Resource Policy Management*

JEL Codes: I2

The Contribution of the Psychology of Religion to the Formation of Ecological Consciousness

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Abstract

The Psychology of Religion contributes to the formation of ecological consciousness through moral and spiritual motives that promote care for nature, such as the Christian concept of "stewardship" or the Buddhist teaching of non-violence. Religious communities strengthen collective environmental action through rituals and related initiatives. Religious narratives influence attitudes toward nature, encouraging responsibility or, in some cases, undermining it due to apocalyptic beliefs. Moreover, religion can alleviate ecological anxiety by offering hope and a sense of meaning. The effectiveness of this influence depends on cultural and religious interpretation: certain indigenous traditions are distinguished by their ecological sensitivity, whereas anthropocentric perspectives tend to limit it.

Keywords: *Psychology of Religion, ecological consciousness, spirituality, environmental ethics, stewardship.*

JEL Codes: O44; O47; O52; Q43; Q56.

Socioeconomic status and pro-environmental behaviours in the EU

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Abstract

The study examines demographic, socioeconomic, occupational, trust, and political determinants of individuals' pro-environmental behaviours—specifically whether they believe they fall short of desired engagement—and their willingness to pay higher environmental taxes, using the 2022 Eurobarometer survey for multiple European countries. Empirical models are estimated for the full sample and for country groups disaggregated by economic development levels. The dataset contains detailed information on respondents' economic status and their economic capacity to engage in energy-saving behaviours. We estimate logistic regression models with heteroskedasticity-robust standard errors for each country group. The results indicate that socioeconomic inequalities are significant drivers of both the likelihood of undertaking environmentally friendly actions (for example, household investments in energy saving) and the willingness and ability to pay higher taxes for environmental protection.

Keywords: *pro-environmentalism; willingness to pay; socioeconomic inequalities; logistic models.*

JEL Codes: D10; H31; I24; Z13.

Session 10.

Sustainable Development: Degrowth & Inclusive Wealth

The role of institutional and socio-economic factors in shaping environmental performance: A cross-country analysis in fluctuating times

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Abstract
This study examines the impact of formal institutions and socio-economic variables—including the Human Development Index (HDI), Consumer Price Index (CPI), renewable energy, technological innovation, and trade openness—on environmental performance across 56 countries (31 developed and 25 developing). The analysis spans two periods: 2011–2019 (a period of stability) and 2011–2020 (encompassing the COVID-19 pandemic). A novel Bayesian Data Envelopment Analysis (DEA) is employed to estimate environmental performance, while a two-step iterative Generalized Method of Moments (GMM) framework assesses the effects of these variables on environmental performance. Key findings highlight the critical role of HDI in enhancing environmental performance during global crises, especially in developing countries. The CPI shows mixed effects when combined with the control of corruption in developed (negative effect) and developing (positive effect) countries on environmental performance. The most significant drivers of environmental performance are lagged environmental performance, country classification (developed or developing), and control of corruption, particularly in developing countries.

Keywords: *Environmental efficiency; Corruption; Human Development Index; Data envelopment analysis; Bayesian methods*

JEL Codes: Q56, Q58, C33

The Economic Geography of Inclusive Wealth: Convergence Clubs Across Nations

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Abstract
Gross Domestic Product (GDP) alone is insufficient to capture the prerequisites of sustainable development. In the Beyond-GDP context, this study advances the Inclusive Wealth Index (IWI), which tracks the evolution of produced, human, and natural capital worldwide from 1990 to 2020. The present analysis focuses on wealth stocks rather than flow-based output, the IWI offers a more comprehensive lens on long-term prosperity and sustainability. Empirically, we identify three convergence "clubs" for both the IWI and its adjusted variant (IWI adj.), indicating heterogeneous development paths across countries. These patterns are corroborated through ordered-logit estimations and slope-homogeneity robustness checks, strengthening confidence in the clustering results. The analysis underscores that countries' sustainable trajectories diverge when natural and human capital are explicitly considered, even when GDP trends appear similar. Policy implications emphasize investing in human capabilities, maintaining and restoring natural assets, and aligning fiscal and regulatory frameworks to safeguard intergenerational well-being and ensure the responsible use of natural resources.

Keywords: *imergeclub; logtreg; log t regression test; inequality, well-being; sustainable development*

JEL Codes: Q01, C23, O44

Degrowth and Planetary Boundaries: Economic Dimensions of an Alternative Paradigm for Sustainable Transition

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Abstract

Degrowth is defined as a deliberate social and political process of reducing energy and material consumption to achieve social equity within sustainable ecological limits. It represents a conscious shift away from the capitalist model of perpetual economic growth, proposing instead a framework for a fair and sustainable socioeconomic system. Despite its growing academic prominence, degrowth remains insufficiently explored regarding its economic implications and political feasibility. This study investigates the relationship between the conceptual framework of planetary boundaries and the theory of degrowth, focusing on their economic dimensions. A systematic literature review was conducted following the PRISMA 2020 guidelines, categorizing the identified economic impacts into three main axes: macroeconomic, microeconomic, and socioeconomic. The results reveal a relatively limited but expanding body of research, suggesting that this alternative economic paradigm may substantially contribute to addressing the global environmental crisis. Nevertheless, its practical implementation requires social legitimization, institutional reforms, and the development of new welfare indicators that can more accurately reflect the multidimensional nature of sustainable progress.

Keywords: *Degrowth; planetary boundaries; sustainability; GDP; economic implications;*

JEL Codes: P41; P43; P44; P48.

Transitional Dynamics and Policy Spillovers. Are Market-Based Instruments and Technology Autarky Structural Drivers in the European Green Transition?

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Abstract
We investigate whether market-based instruments and technology autarky act as structural drivers of the European green transition. We focus on two pillars of structural transformation, EU climate policy, captured by the Emissions Trading System (carbon pricing) and renewable feed-in tariffs, and green technology sovereignty, measured by technological independence. Using panel data for the EU-28 during 2010-2019 and an instrumental variables panel quantile estimator on the Green Growth Index, we analyse both contemporaneous and lagged effects to capture transitional dynamics and diffusion channels. Results show that policy and technology changes exert strong and consistent effects on green growth progress. While contemporaneous levels have immediate effects, reinforcing mechanisms operate through diffusion. Technology autarky emerges as a balancing factor, mitigating adverse effects of green policy. Findings underscore the need for integrated policy frameworks aligning market incentives with domestic technological capabilities to drive European green transition. This study contributes to SDGs 7,8,9,12,13, and 16.

Keywords: *EU ETS; Green Technology Independence; Green Transition; Instrumental Variables Panel Quantile Estimator; Environmental Policy Effectiveness; Europe*

JEL Codes: O38; Q54; Q58

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Session 11.

CSR - ESG

The role of internal CSR as driver of sustainable innovation through intrapreneurship

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Abstract

This paper investigates the role of internal corporate social responsibility (CSR) in fostering a culture conducive to sustainable innovation within established organizations. Internal CSR is conceptualized as a fundamental organizational dimension that cultivates employee motivation, commitment, and empowerment toward innovation practices aligned with sustainability principles. The primary aim of this study is to develop a conceptual framework that elucidates the interconnections among internal CSR, intrapreneurship, and sustainable innovation. Intrapreneurship is approached as the mediating mechanism through which internal CSR values and practices are transmitted to employees, enabling the translation of responsible organizational culture into sustainability-oriented innovative outcomes. The paper adopts an exploratory and conceptual methodology, grounded in an extensive review of the relevant literature. Through this approach, it seeks to identify theoretical linkages, underlying mechanisms, and critical research questions that can inform future empirical investigations of the triadic relationship among the three constructs. By integrating insights from the domains of CSR, intrapreneurship, and sustainable innovation, this study aspires to contribute to the theoretical advancement of how internal CSR practices may underpin and strengthen organizational capacities for sustainable innovation through the promotion of a culture of sustainable intrapreneurship.

Keywords: *CSR and Corporate Culture, intrapreneurship / corporate entrepreneurship, innovation processes, sustainability context, knowledge sharing and learning mechanisms*

JEL Codes: M14, L26, O31, Q01, D83

Disability and Social Economy: Corporate Responsibility for Equal Employment Opportunities in NGOs

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Abstract

This study explores the extent to which Non-Governmental and Non-Profit Organizations (NGOs) demonstrate corporate and social responsibility toward employees and volunteers with special needs. The theoretical framework analyzes key disability models, the relevant regulatory context, and the principles of corporate social responsibility within the sphere of the social economy. The empirical part adopts a quantitative methodology through a structured questionnaire focusing on individuals who self-identify as persons with disabilities, aiming to capture existing inclusion policies, organizational culture, and diversity management practices. The study seeks to highlight the role of NGOs as agents of equality and social inclusion, as well as to formulate recommendations for enhancing accessibility, non-discrimination, and the professional empowerment of people with disabilities in the workplace. The contribution of this research lies in understanding the factors that influence the implementation of social responsibility principles and in providing policy directions for more inclusive and equitable organizations.

Keywords: *NGOs; disability; corporate social responsibility; social inclusion; accessibility; non-discrimination.*

JEL Codes: Q53; Q56; Q58.

Embedding ESG in European Small-Medium Enterprises: The Role of Environmental Management Systems and International Standards

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Abstract
Environmental risks threaten the continuity, compliance, and long-term competitiveness of small and medium-sized enterprises (SMEs) in a market that is increasingly sustainability-oriented and data-driven. This review develops a comprehensive framework for Environmental Management Systems (EMS) with emphasis on ISO 14001 and EMAS and examines their connections to Corporate Social Responsibility (CSR) and Environmental, Social, and Governance (ESG) frameworks. The study overviews 47 papers indexed in Scopus, Web of Science, and Google Scholar, it also assesses the emerging role of the European Sustainability Reporting Standards (ESRS) in boosting environmental action for SMEs. The contribution of this study lies in integrating EMS tools with different ESG and ESRS mechanisms. Specifically, there are two objectives: (i) to investigate the interlinkages of international standards with ESG framework and (ii) to evaluate their combined capacity to strengthen SME resilience against environmental or other risks. The empirical findings indicate that a synergistic approach not only underpins regulatory transparency but also engages to the Sustainable Development Goals (SDGs). Overall, the review provides actionable insights and policy implications for SMEs on integrating EMS within ESG, aiming to reinforce resilience to environmental risks and align with future market conditions for sustainability.

Keywords: *CSR; ESG; CSRD; SDGs; SMEs; European Green Deal.*

JEL Codes: Q56, M14, L26

Corporate Social Responsibility as a New Perspective for Tackling the Refugee Problem

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Abstract

The large and uncontrolled flows of refugees to Europe have created crisis conditions in host countries in recent years. In various European countries, there have been strong reactions that are reflected in the policies of these countries, with the emergence of political groups with extreme and conservative political rhetoric. Reactions also come from local communities that are hesitant about refugees, mainly on labor issues. However, refugees also face problems at the legal, social, and political levels. To date, the relevant discussion on refugees has been limited to the level of state policy, while there is no discussion of the possibility of the private sector contributing to solutions to these problems. The rationale for such a discussion is, first, to examine whether the private sector, within the framework of Corporate Social Responsibility, incorporates issues relating to marginalized individuals such as refugees. In this context, this paper uses the methodology of a literature review to record and highlight ways in which companies could help overcome refugee problems through CSR. The paper also aims to show how the private sector can offer assistance to the public sector, which has shouldered the burden of the refugee crisis, with a heavy economic burden being passed on to citizens either in the form of higher taxes or fewer state benefits.

Keywords: CSR, refugee crisis, labor market, and refugees.

JEL Codes: M14, F22, O15, D64:

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