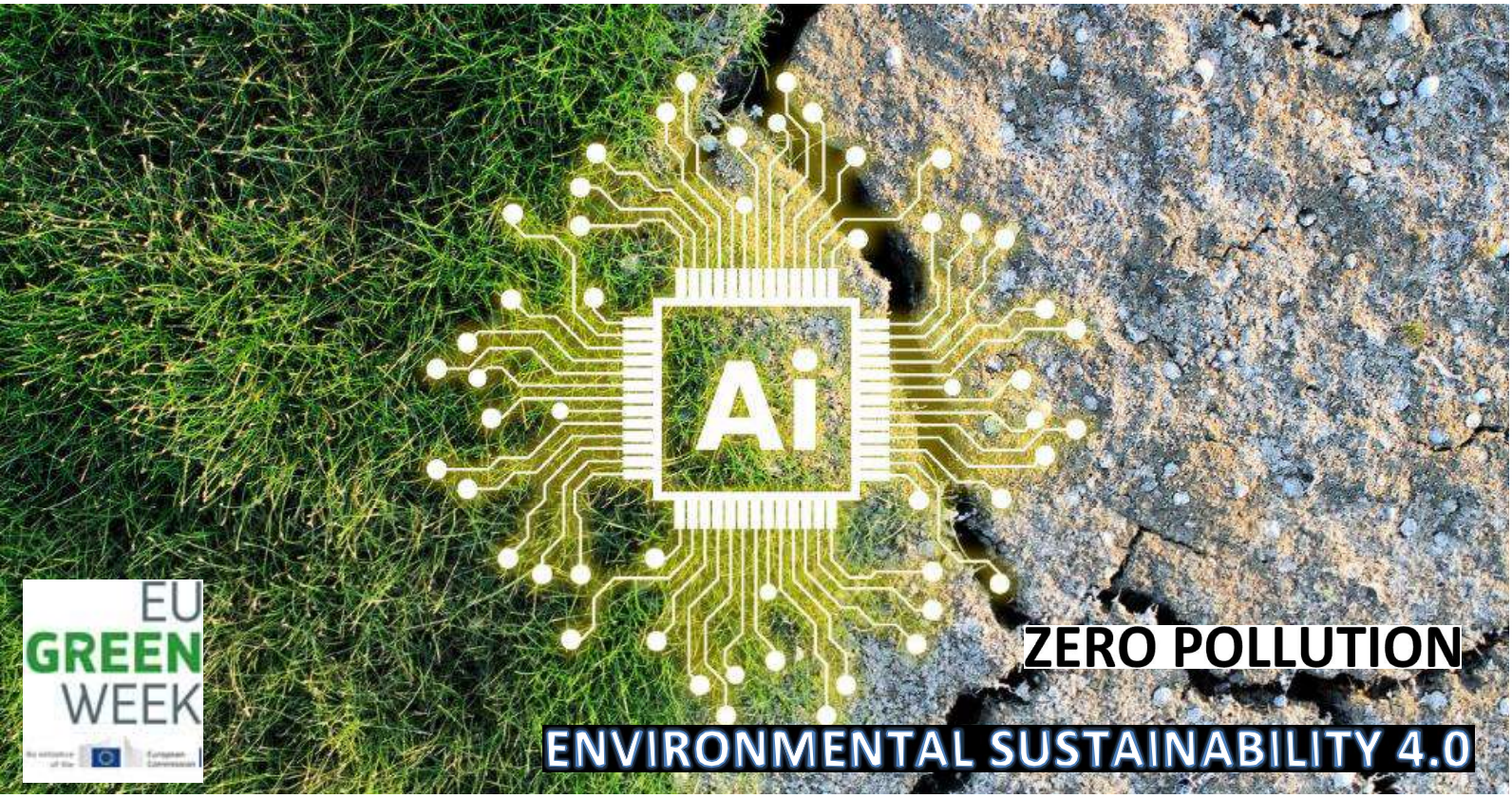
BOOK OF
ABSTRACTS



5th International Workshop

TOWARDS ZERO POLLUTION

2025 Viseu
29 May

May, 2025

Title: 5th International WORKSHOP: ZERO POLLUTION – Environmental Sustainability 4.0

Editor
Escola Superior de Tecnologia e Gestão de Viseu

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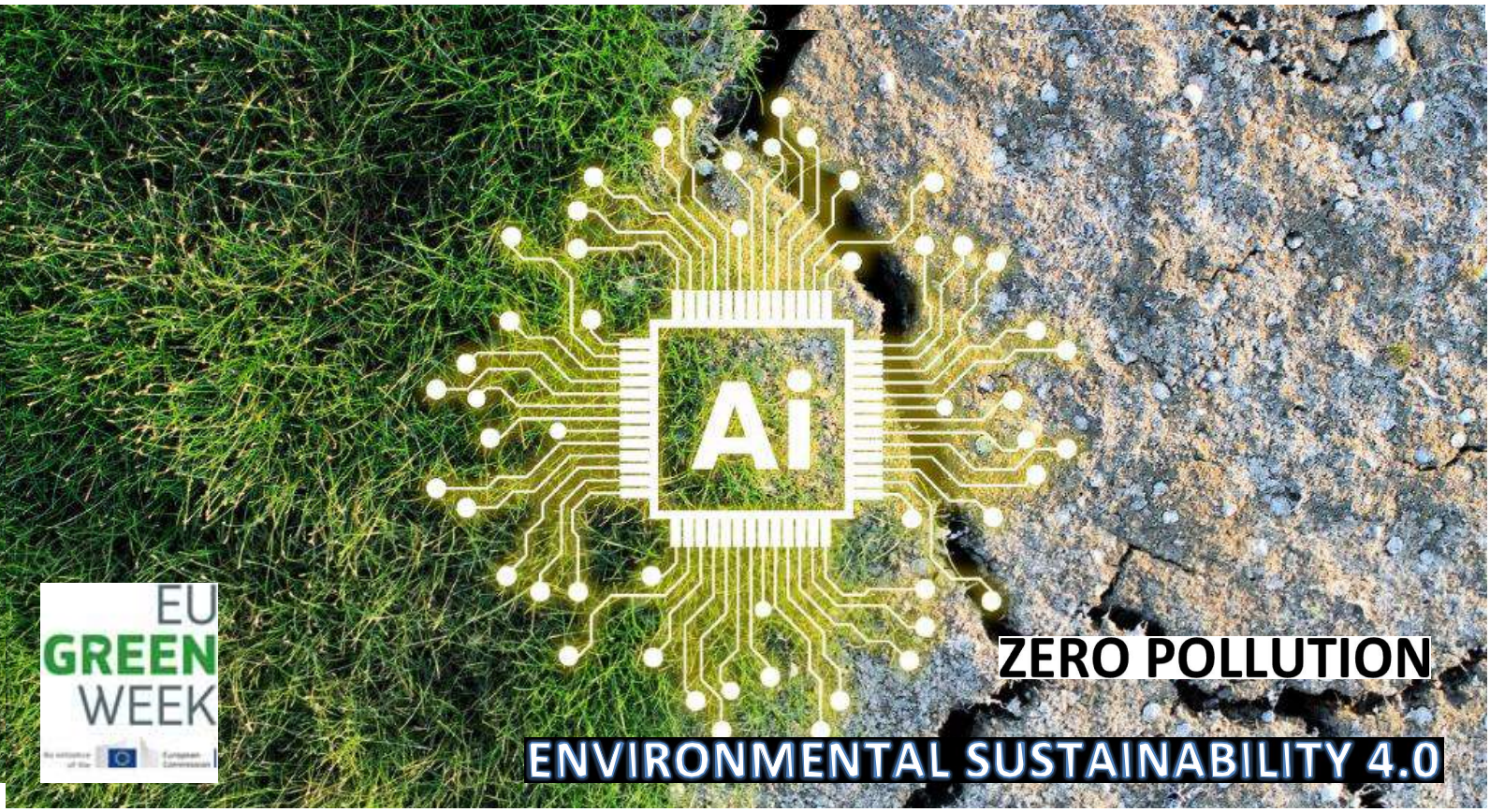


The European Green Week is an annual event organised by the European Commission to address environmental issues and promote sustainable initiatives. In 2025, the event is themed *"Circular Solutions for a Competitive EU"*, highlighting the European Union's commitment to integrating digital technologies with ecological practices, aiming for a green, efficient, and innovative transition.

It brings together researchers, students, teachers, and institutional partners around a common goal: building scientific and technological solutions that move us closer to a zero-pollution future. This approach combines sustainability with digital transformation through the application of artificial intelligence, the Internet of Things (IoT), and data analysis in environmental monitoring, smart resource management, and emission reduction. The adoption of these technologies enables process optimisation, strengthens the circular economy, and enhances energy efficiency across various sectors. Sustainability 4.0 also promotes climate justice and social inclusion, ensuring that technological innovation benefits all citizens and supports a fair ecological transition.

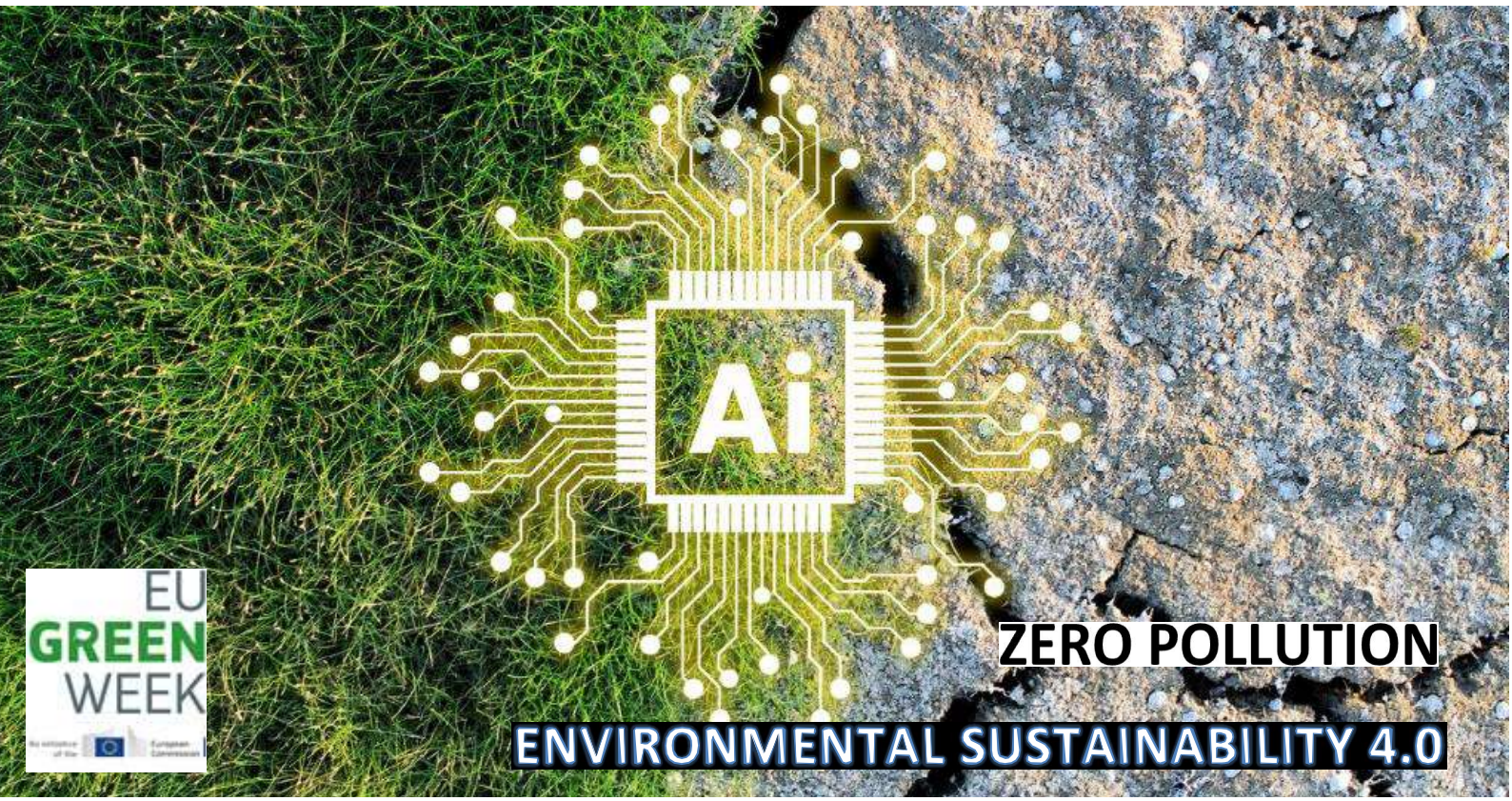
At a time when environmental challenges intersect with the need for digital transformation and social justice, the works presented demonstrate the vitality of applied research, the creativity of interdisciplinary approaches, and the commitment to the goals of the European Green Deal and the EU Zero Pollution Strategy.

This collection of abstracts reflects the wide range of topics covered — from the valorisation of local waste and clean technologies in industry, to environmental impact assessment, sustainable agriculture, air quality, effluent monitoring, energy efficiency, and the transformation of business models. The works range across different scales: from micro to macro, from local to global, and from digital to biological.

Projects such as the sustainable valorisation of invasive plant biomass, the development of biotechnological databases such as *Blue Amazon*, or the application of IoT technologies for energy efficiency show how knowledge can act as a catalyst for environmental innovation. Other proposals, such as life cycle assessment of IT equipment and the management of livestock and agro-industrial waste, demonstrate the transformative potential of science in the service of sustainability.

The *"Towards Zero Pollution"* workshop went beyond the sharing of technical knowledge. It created a space for critical reflection, for encounters between disciplines, and for dialogue across generations and sectors. By valuing local resources, promoting nature-based solutions, rethinking value chains, and exploring digital tools, participants made a significant contribution to the ongoing dialogue and practical efforts aimed at mitigating pollution. It is hoped that the abstracts presented here will serve not only as an inspiring record of the ideas shared but also as a starting point for new collaborations, projects, and sustainable policies.

By the Organizing Committee



A Semana Verde Europeia é um evento anual organizado pela Comissão Europeia para abordar questões ambientais e promover iniciativas sustentáveis. Em 2025, o evento tem como tema "Soluções Circulares para uma UE Competitiva", destacando o empenho da União Europeia em integrar tecnologias digitais com práticas ecológicas, com vista a uma transição verde, eficiente e inovadora.

Reúne investigadores, estudantes, professores e parceiros institucionais em torno de um objetivo comum: construir soluções científicas e tecnológicas que nos aproximem de um futuro com poluição zero. Esta abordagem alia a sustentabilidade à transformação digital, através da aplicação de inteligência artificial, Internet das Coisas (IoT) e análise de dados na monitorização ambiental, gestão inteligente de recursos e redução de emissões. A adoção destas tecnologias permite otimizar processos, reforçar a economia circular e melhorar a eficiência energética em vários sectores. A Sustentabilidade 4.0 promove também a justiça climática e a inclusão social, garantindo que a inovação tecnológica beneficia todos os cidadãos e apoia uma transição ecológica justa.

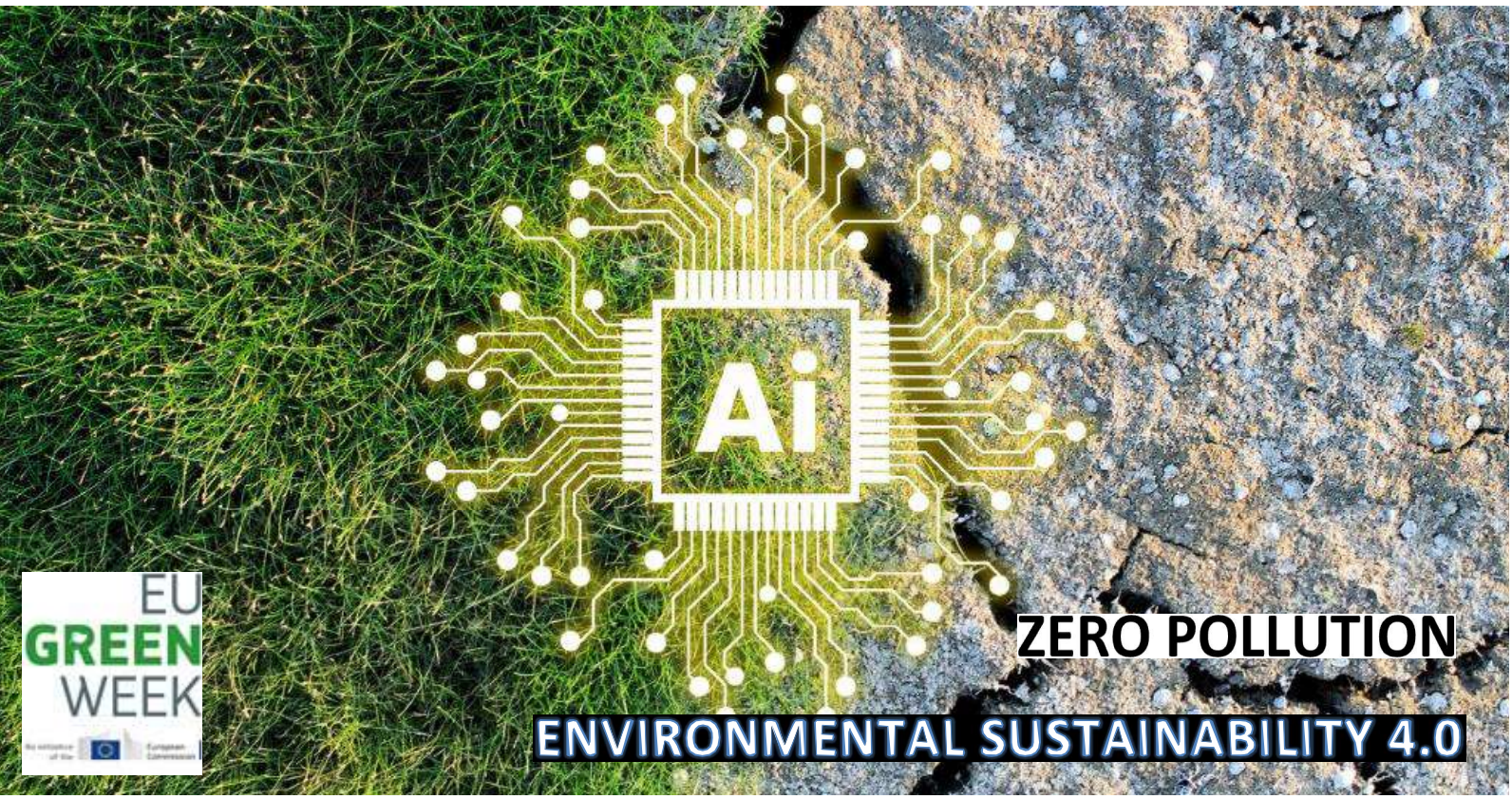
Num momento em que os desafios ambientais se cruzam com a necessidade de transformação digital e justiça social, os trabalhos apresentados demonstram a vitalidade da investigação aplicada, a criatividade das abordagens interdisciplinares e o compromisso com os objetivos do Pacto Ecológico Europeu e da Estratégia da UE para a Poluição Zero.

Esta compilação de resumos reflete a diversidade dos temas abordados — desde a valorização de resíduos locais e tecnologias limpas na indústria, à avaliação de impacto ambiental, agricultura sustentável, qualidade do ar, monitorização de efluentes, eficiência energética e transformação de modelos de negócio. Os trabalhos abrangem escalas que vão do micro ao macro, do local ao global, do digital ao biológico.

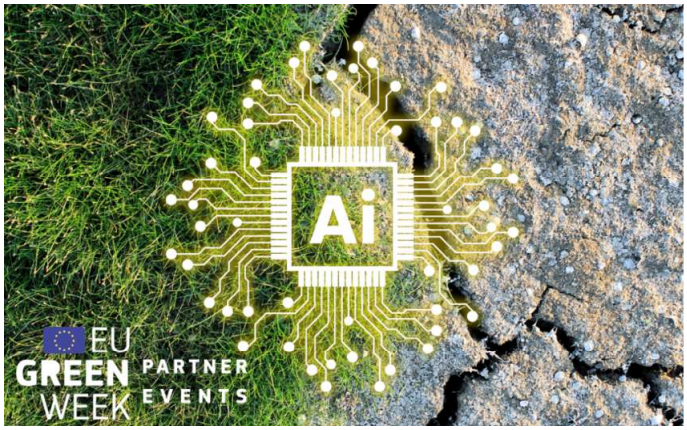
Projetos como a valorização sustentável de biomassa de plantas invasoras, o desenvolvimento de bases de dados biotecnológicas como a Blue Amazon, ou a aplicação de tecnologias IoT para eficiência energética, revelam como o conhecimento pode ser um catalisador da inovação ambiental. Outras propostas, como a avaliação do ciclo de vida de equipamentos informáticos, gestão de resíduos pecuários e agroindustriais, demonstram o potencial transformador da ciência ao serviço da sustentabilidade.

O workshop “Rumo à Poluição Zero” não se limitou à partilha de conhecimento técnico. Criou um espaço de reflexão crítica, de encontros entre áreas disciplinares e de diálogo entre gerações e setores. Ao valorizar recursos locais, promover soluções baseadas na natureza, repensar cadeias de valor e explorar ferramentas digitais, os participantes deram um contributo significativo para o debate e ação em torno da poluição e da sua mitigação. Espera-se que os resumos aqui apresentados possam ser um registo inspirador das ideias partilhadas e, acima de tudo, um ponto de partida para novas colaborações, projetos e políticas sustentáveis.

Pela Comissão Organizadora



Brief description of the program



ZERO POLLUTION
ENVIRONMENTAL SUSTAINABILITY 4.0

5th International Workshop

May 29/30, 2025

Superior School of Technology and Management
Polytechnic of Viseu

MAY
29

PROGRAM

09h30 – WELCOME

- **Luís Simões**, Head of the Environmental Department
- **José Abrantes**, President of the Digital Services Research Center
- **José Pereira**, Scientific Coordinator of the Research Centre for Natural Resources, Environment and Society

10h00 – KEYNOTE: ENVIRONMENTAL SUSTAINABILITY 4.0

- *Industry 4.0 versus Industry 5.0* **| Jana Kostalova**
- *Circular Economy Models in the Czech Industrial Context* **| Simona Munzarova**
- *Product Life Cycle Key Performance Indicators* **| Jan Vavra**

Moderation: **Isabel Brás**

11h00 – COFFEE BREAK

11h30 – ORAL PRESENTATIONS – SESSION **1**

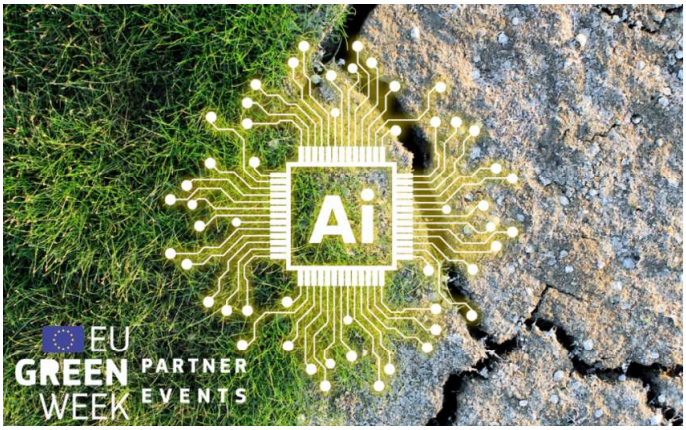
13h00 – LUNCH

14h30 – ORAL PRESENTATIONS – SESSION **2**

16h00 – COFFEE BREAK / POSTER PRESENTATION

16h30 – ORAL PRESENTATIONS – SESSION **3**

18h00 – CLOSING SESSION



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Polytechnic of Viseu

MAY
30

PROGRAM

09h15 – WELCOME

- **José dos Santos Costa**, President of the Polytechnic of Viseu
- **Luís Simões**, Head of the Environmental Department
- **António Ventura**, President of the School of Technology and Management of Viseu
- **Fernando Ruas**, Mayor of Viseu
- **Elísio Oliveira**, President of the Star Institute

10h00 – KEYNOTE: TECHNOLOGICAL AND DIGITAL SUPPORT TO ENVIRONMENTAL SUSTAINABILITY

- *Green Electronics: Sustainable Materials for a Smarter Future* | **Elvira Fortunato**

Moderation: **Filipe Caldeira**

11h00 – COFFEE BREAK

11h15 – ENTERPRISES PITCHS: SMART CITIES

- *Building Culture for Smart(er) Cities and Communities – Highlights* | **Raúl Junqueiro**
- *Digital Innovation for Sustainability: From Theory to Impact* | **Sérgio Ivan Lopes**
- *Urban Management – An Essential Ally in Achieving Zero Pollution* | **Ana Pereira**

Moderation: **Ricardo Correia**

13h00 – LUNCH

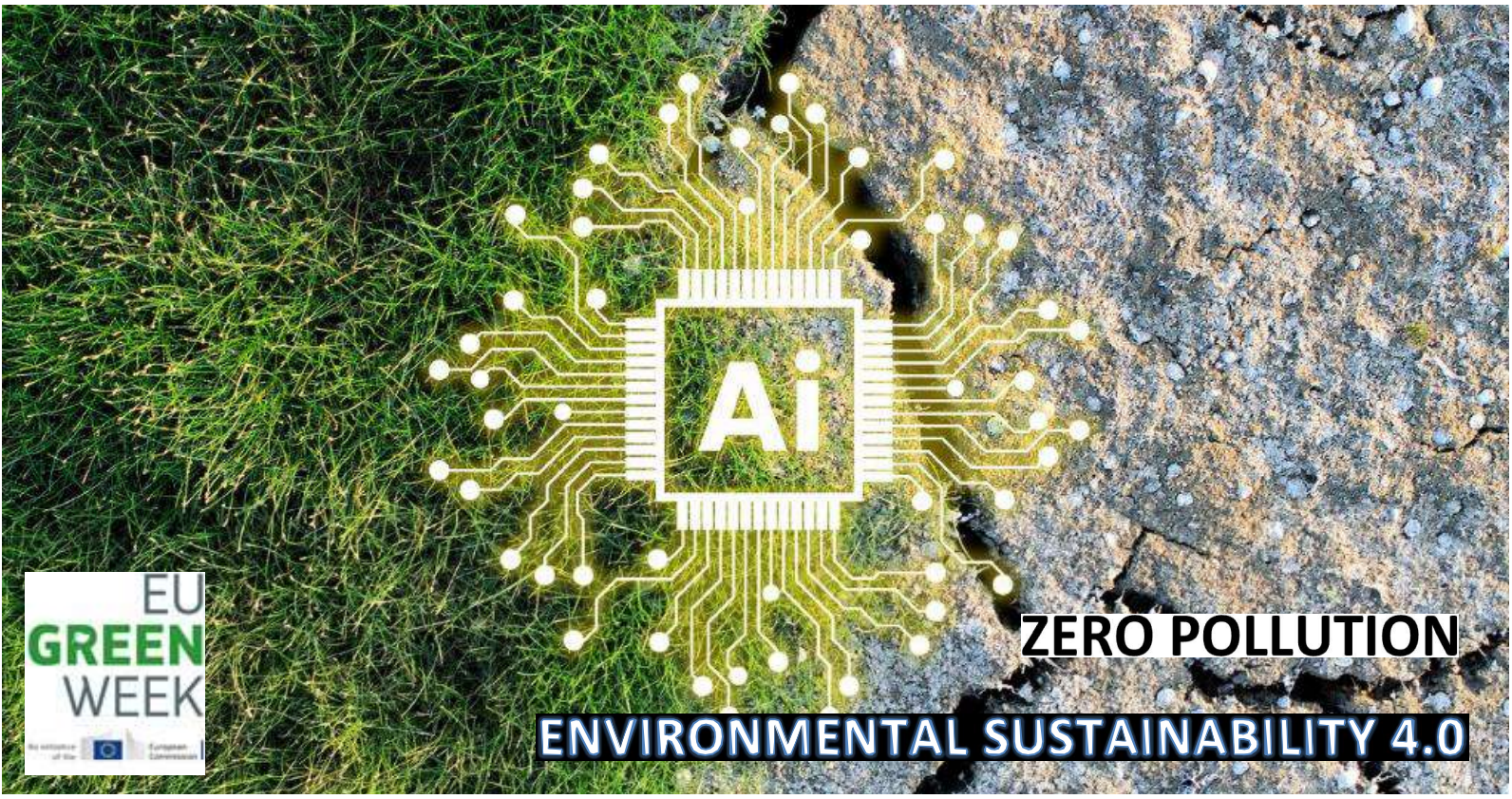
14h30 – SOCIAL EVENT and NETWORKING / ICEBREAK

15h00 – ENTERPRISES PITCHS: TERRESTRIAL AND SPACE SENSING

- *Sustainable IoT Connectivity from Space* | **André Guerra**
- *Silvanet System – Scaling Ultra Early Wildfire Detection* | **Pedro Silva**
- *Aveiro Tech City Living Lab: Technology for Smart and Sustainable Cities* | **Pedro Rito**

Moderation: **Sérgio Gomes Lopes**

18h00 – CLOSING SESSION



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Nuno Miguel Rodrigues
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Polytechnic of Viseu

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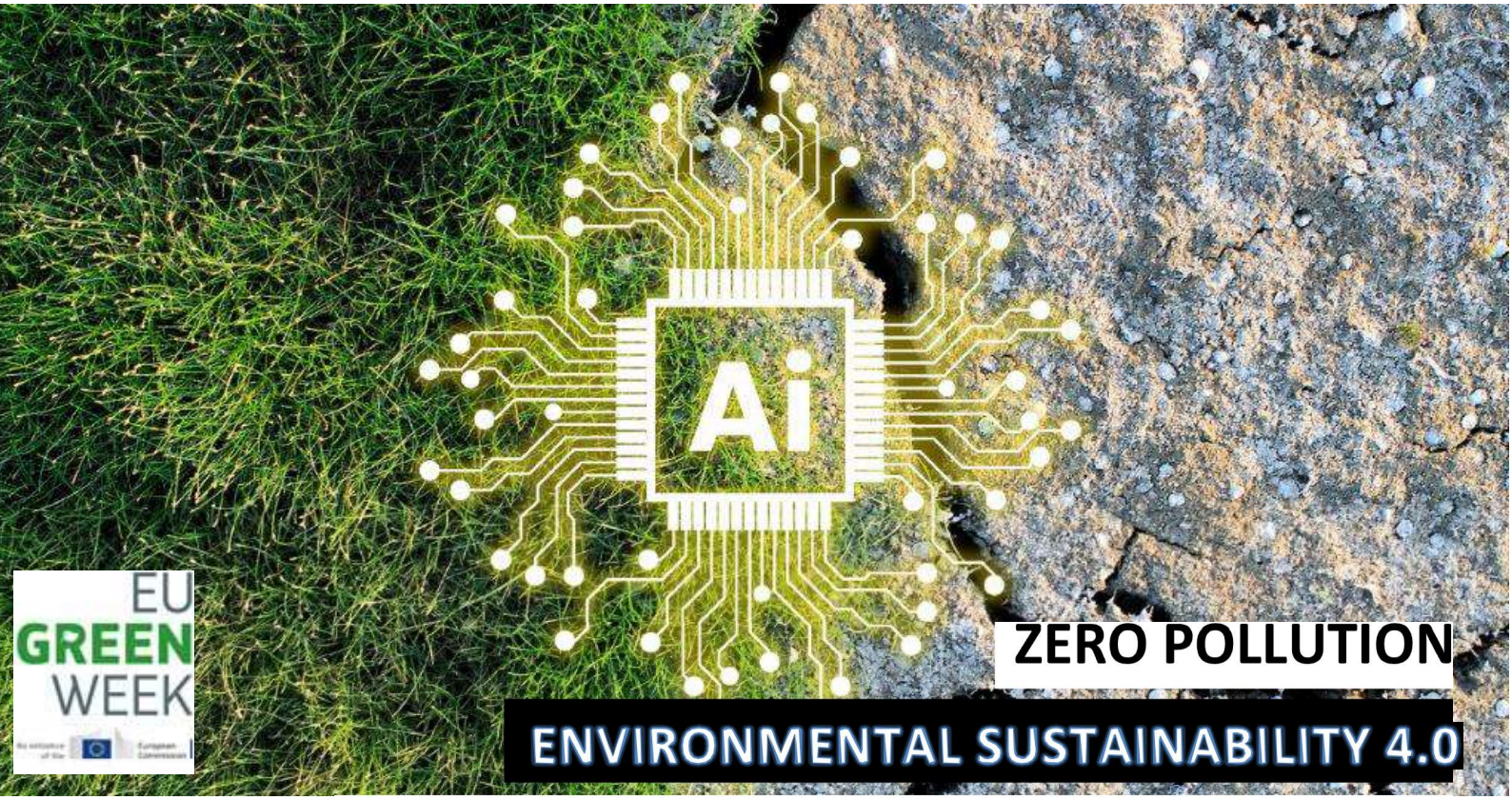

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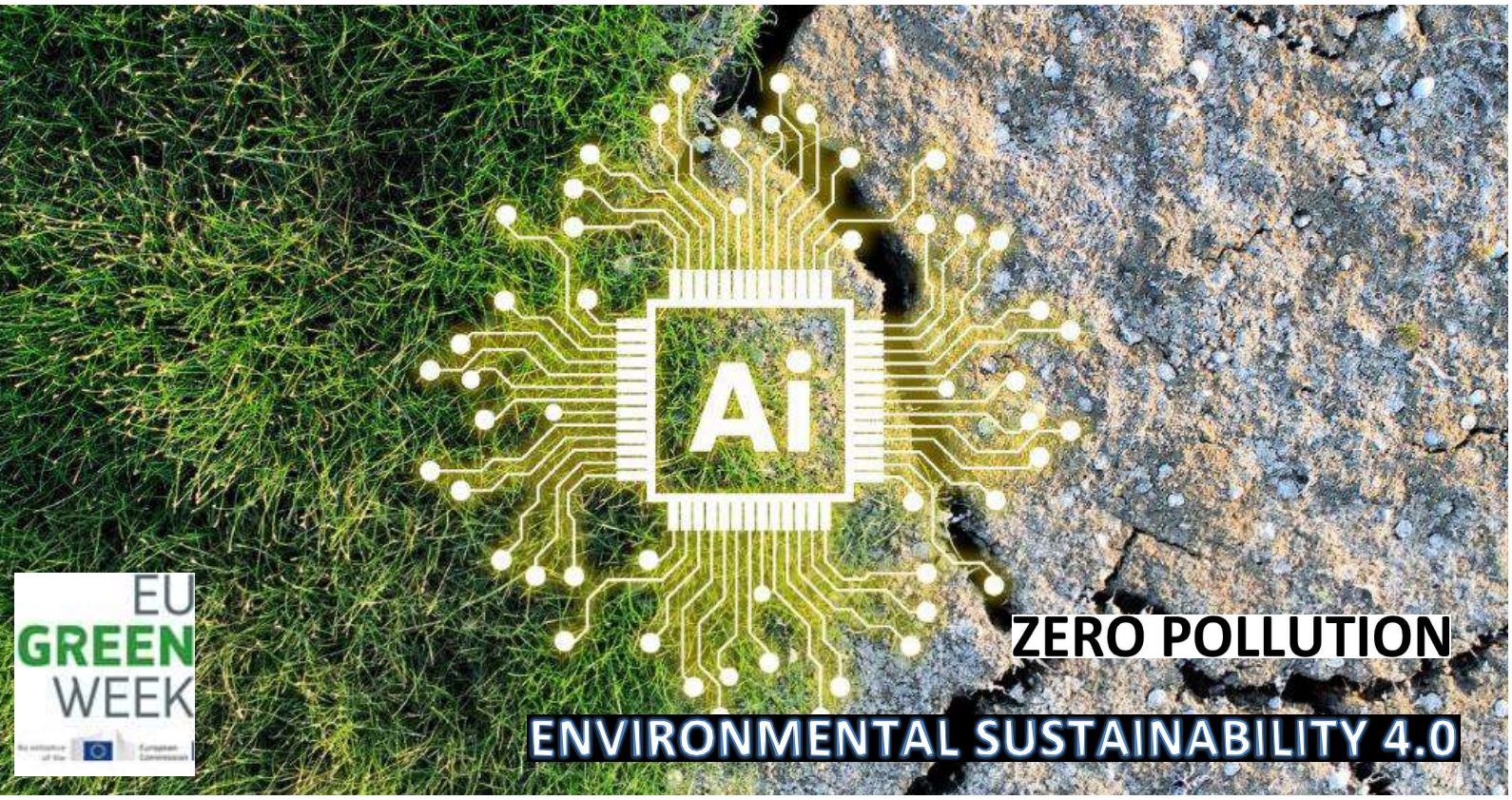
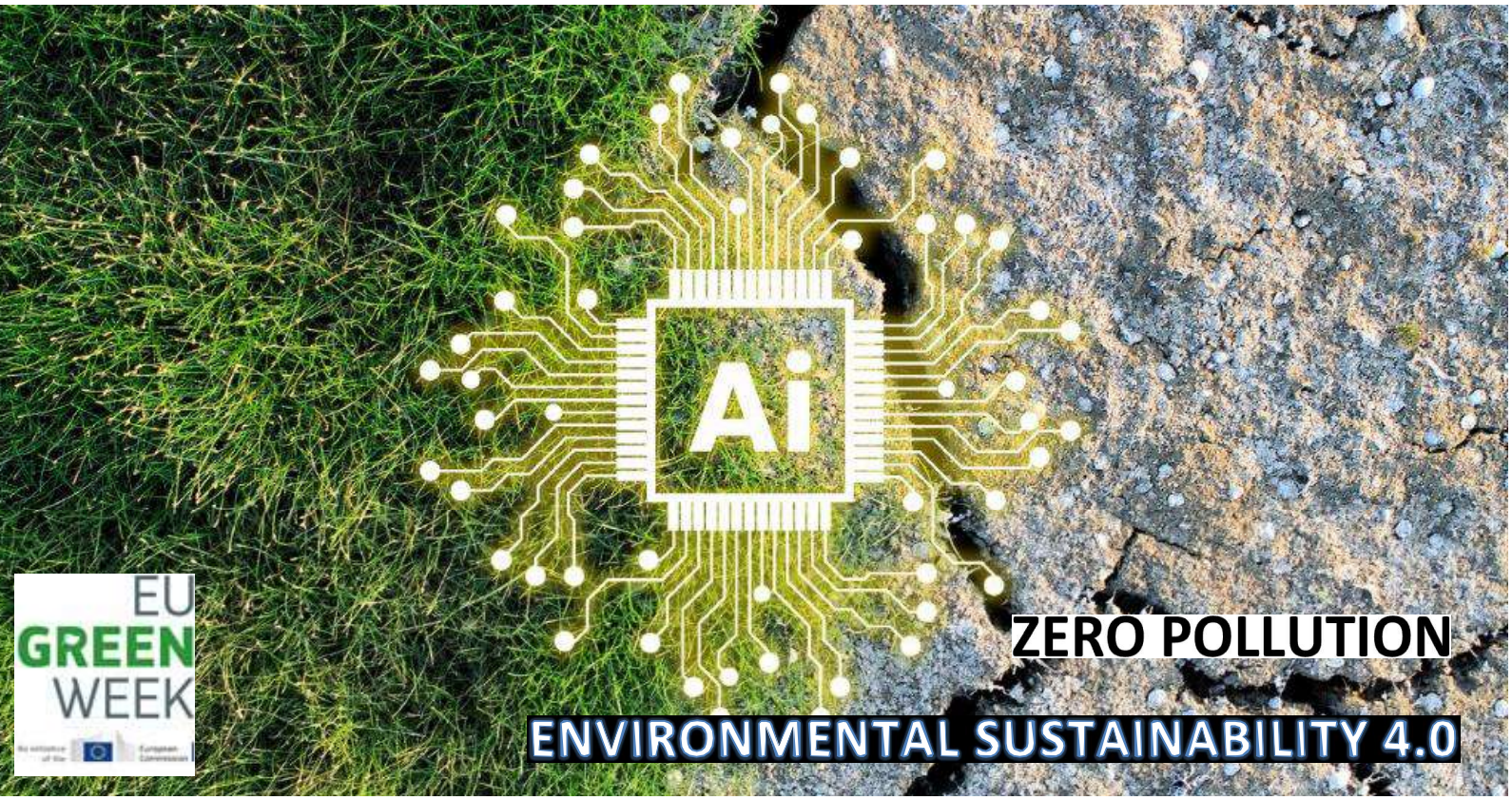


INDEX

ORAL COMMUNICATION



INDEX

POSTER COMMUNICATION

Food Waste - Consumer Perspective

Paulo Ribeiro[1], Ofélia Anjos[2], Luísa Cruz-Lopes[3], Raquel Guiné[3]
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Abstract

This research was developed to investigate people's attitudes towards food waste and how these possibly change according to sociodemographic groups. The consumer study was carried out in 16 countries (Argentina, Brazil, Croatia, Egypt, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Serbia, Slovenia, and United States of America), and involved 11916 participants. The main questions related to food waste were: Q1. When I cook I have in mind the quantities to avoid food waste; Q2. It is important to me that the food I eat comes from my own country; Q3. I avoid going to restaurants that do not have a recovery policy of food surplus. The questionnaire as applied online and for the treatment of the data, the SPSS was used, considering a level of significance of 5% in all tests. Parametric tests (T-test and ANOVA) were used to compare means between groups. A classification tree analysis was also performed, following the Classification and Regression Trees (CRT) algorithm with cross-validation.
The results allowed confirming that the country was the most influential factor of all variables considered, and statistically significant differences were between groups for practically all sociodemographic variables, in terms of avoiding food waste when cooking at home, choosing foods locally and preferring restaurants that promote food recovery. In conclusion, this work showed an interesting perspective of how sociodemographic and geographic variability can shape consumer's attitudes regarding food waste.

Keywords

Sustainable attitudes; Consumer perspective; Food waste; Food surplus.

Acknowledgements

The authors would like to thank FCT – Foundation for Science and Technology, within the scope of project Ref. UIDB/00681 (CERNAS Research Centre), and the Polytechnic Universities of Castelo Branco, Coimbra, and Viseu; as well as CECOLAB – Collaborative Laboratory Towards Circular Economy, for enabling the participation of Paulo Ribeiro in the 5th International Workshop – Towards Zero Pollution.