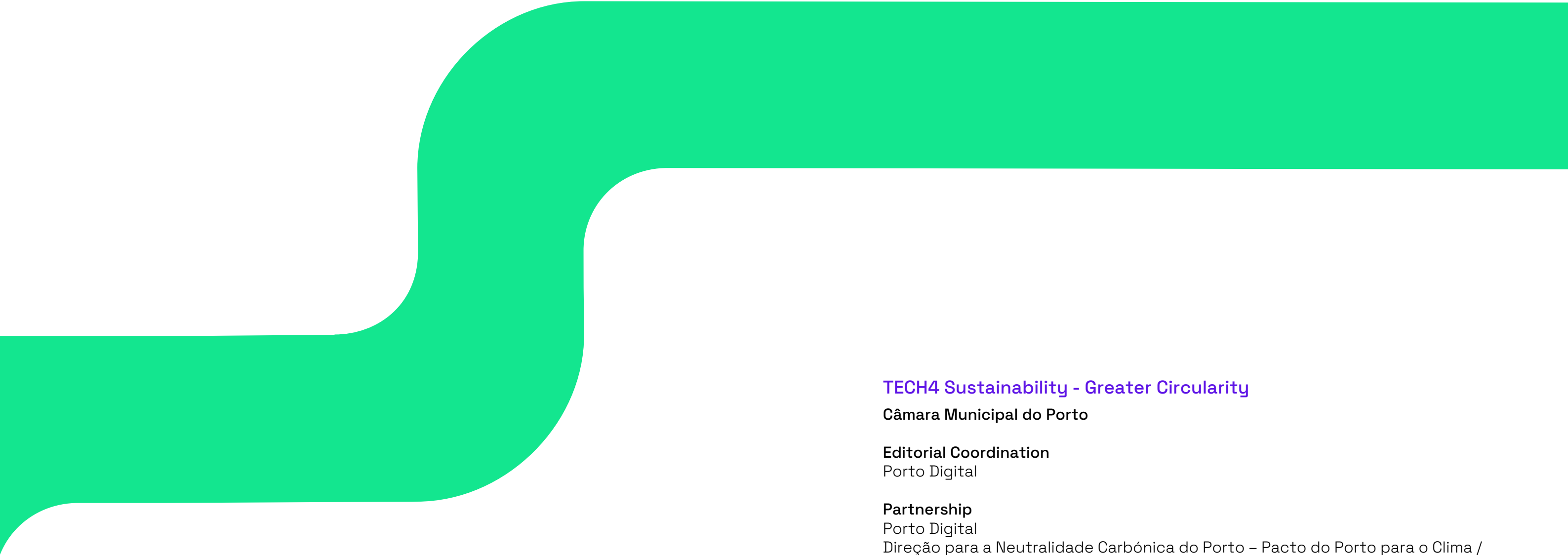




Greater Circularity

White Paper





TECH4 Sustainability - Greater Circularity

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TECH4 Sustainability

the connection between
the academy and the
city for sustainability

TECH4 Sustainability highlights and promotes sustainability projects that apply **science, technology and innovation** to solve urban challenges. This activity is promoted by the **Municipality of Porto**, under the coordination of **Porto Digital** and the **Directorate for Carbon Neutrality of Porto** – within the scope of the **Porto Climate Pact activity** – in partnership with the **Faculty of Engineering of the University of Porto (FEUP)**, aims to strengthen the relationship between academic research and practical projects implemented in the city of Porto.

This activity focuses on three priority areas: **Greater Circularity**, **More Clean Energy** and **Better Mobility**. These topics are crucial to Porto's commitments within the scope of the **100 Climate-Neutral and Smart Cities**, fostering extensive collaboration between public and private entities to benefit citizens.

Greater Circularity is the first theme that highlights the essential role of the **circular economy** in achieving a **more sustainable Porto** across various levels. It aims to replace the linear model with practices that prioritize the reuse of materials and the reintegration of waste into the value chain, thereby reducing waste and the demand for new resource extractions. This approach is fundamental for achieving objectives such as reducing Europe's reliance on external resources.

The transition to this model is not without challenges, as it requires collaboration among diverse stakeholders and the transformation of traditional business models. In Porto, sustainable construction plays a key role, promoting circularity by design, as explored in this edition, where the deconstruction of buildings is planned while they are still in their development phase. The ongoing work of several researchers, showcased in multiple projects, has led to the development of practical solutions that can be implemented locally. Furthermore, planning becomes key in the construction sector, which is responsible for a significant part of global emissions. By adopting best practices in this field, the city can make substantial progress in reducing its ecological footprint.

Within the **urban water cycle**, ensuring effective management is critically urgent. The scarcity of drinking water presents significant challenges to the daily functioning of any city. Therefore, implementing targeted solutions such as advanced water treatment, the production of "new water" from greywater, and reducing drinking water consumption is especially vital in regions most affected by drought.



Throughout the life cycle of biomaterials – from production to decomposition – there are key decisions that significantly impact the generation of carbon and other greenhouse gases. In this context, the carbon footprint calculation of food, a focus of research by the Academy, can provide citizens with more precise information, enabling them to make more informed and conscious choices. Additionally, actions such as **reducing food waste and processing organic waste for use as soil enhancers** are already being implemented in the city, yielding positive sustainability outcomes. These initiatives have the potential to scale up and make an even greater impact.

It is also important to highlight the valuable outcomes that arise when the City and the Academy collaborate in shaping the future. In this regard, **Porto Ambiente – Empresa Municipal de Ambiente do Porto** – has played a crucial role in **implementing sustainability practices**. By revolutionizing waste collection and urban cleaning, the company has fostered a strong partnership with Academia. This collaboration has enabled the optimization of operations, enhanced service quality, and promoted **greater circularity in urban practices**, a key topic explored in this edition.



While the initial focus is on circularity, **TECH4 Sustainability** has the potential to explore other topics and areas of innovation in future editions. The **ongoing collaboration between Academia and the City** will remain essential for **developing innovative solutions** to address the complex urban and environmental challenges ahead.

Porto is positioning itself as a leading **example of sustainability in Europe**. Achieving these objectives will rely on the active engagement of various sectors of society, fostering synergies that will make the **city more resilient, intelligent, and carbon neutral**.

Circular2B

Joana Maia

Reusing waste offers numerous advantages, ranging from **energy and material savings** to **reduced production costs**. It also helps **minimize waste and space in landfills**, thereby **promoting the circular economy in civil construction**.

The project's impact extends on multiple levels: it fosters the **development of eco-sustainable nanomaterials through waste recycling, which are integrated into highly energy-efficient modular construction systems**. It also contributes significantly to the decarbonization of the sector. Moreover, the **industrial-scale production of environmentally sustainable and more cost-effective solutions will help improve living conditions, reduce socio-economic disparities, and promote greater social inclusion**.

The project consortium, led by the **Faculty of Engineering of the University of Porto (FEUP)**, includes institutions from various sectors: in education, the **University of Trás-os-Montes e Alto Douro (UTAD)** and the **Faculty of Sciences of the University of Porto (FCUP)**; in the construction industry, **Dreamdomus (a company specializing in modular construction)**; and **SINTEF**, a Norwegian partner with international expertise in technology, natural sciences, medicine, and social sciences.

The **Circular2B** project aimed to **integrate energy efficiency with waste recovery**, focusing on the development of two new materials: **the insulating core of panels (SIP – Structural Insulated Panels)** and the **exterior finishing coating**. These innovations replace current materials with functionally equivalent alternatives made from recovered plastics (such as RCD, slag, and others). The emphasis on prefabrication (modular construction) was driven by this approach significantly reducing RCD waste.

The project's goal was to **optimize a commercial modular enclosure solution** produced by the consortium's industrial partner. This process involved selecting waste materials, incorporating them into new high-performance mortars for the construction of the modular panels, and then conducting experimental, numerical, and environmental evaluations.

CDW_LongTerm

Valorization of construction and demolition waste in geosynthetic reinforced landfills

Waste management and recovery are critical areas of focus in the **construction sector**, recognized globally for their importance. The challenge of managing large volumes of waste, coupled with environmental concerns related to the overexploitation of natural resources, has driven the **development of recycling and waste recovery strategies**. These efforts have been reinforced by **directives from the European Commission**.

In recent years, **numerous studies and applications of recycled aggregates from CDW (Construction and Demolition Waste)**, also known as recycled CDW, have been conducted and published. However, knowledge about the long-term behavior of these materials and the structures in which they are utilized remains limited.

Castorina Vieira

It is in this context that the **CDW_LongTerm project** emerged. The innovative nature of the project focuses on the **study of the long-term behaviour of recycled CDW** and of a **geotechnical structure built with these materials**. Another particularity refers to the use of recycled CDW available on the market, which is less accepted because it is a fine material (similar in size to sand) and obtained from unselected CDW (mixture of concrete, mortar, ceramics, soil, rocks, etc.). It should be noted that the vast majority of studies that have been carried out at national and international level essentially use selected recycled aggregates, that is, they do not correspond to the materials that waste management operators in Portugal are actually able to produce and market.

Although terms such as **“circular economy”** or **“circularity”** are currently very much in vogue, the use of **recycled materials continues to face many barriers**. Therefore, it is extremely important to develop applied research that demonstrates that products, structures or infrastructures in which recycled materials are used, such as CDW, will behave appropriately throughout their useful life.

Therefore, the main objective of this research project is to **demonstrate the adequate performance of geosynthetic reinforced structures built with recycled CDW, contributing to mitigate the barriers to the use of alternative materials in the construction sector**. Based on the results obtained in the extensive laboratory program, the good performance of the pilot plant and the different dissemination activities, it is considered that the project objectives were achieved.

In a logic of **promotion and valorization of CDW**, this research constitutes a **contribution to a more efficient management of natural resources and to potential implementation of circularity in the construction sector**.

3D

Bárbara Rangel

A multidisciplinary research group at FEUP's Civil Engineering Department is dedicated to **studying the impact of Industry 4.0 on the construction sector**, with a particular focus on the **innovations enabled by large-scale 3D printing and modular construction**. DIGI@feup3DC aims to unite various scientific fields – including **Mechanical Engineering, Mining and Materials Engineering, Architecture, and Industrial Design** – to analyze in an integrated way how industrialization and digitalization processes can enhance the construction industry.

What does this entail? In the context of **3D printing**, the group tests **different mortar formulations, assesses their behavior** in both fresh and hardened states, and studies construction **elements fabricated off-site**. Additionally, they **evaluate the performance of buildings printed in situ**, exploring their architectural potential and the formal opportunities this technology brings to design projects. For modular construction, the research focuses on optimizing industrial processes by moving most construction element production to factories. The team also investigates the **potential of 3D printing** to enable the customization of **prefabricated products, enhancing flexibility and innovation in construction**.

Synergy with the industry

The laboratory is now equipped with **two large and medium-scale printers**, which has facilitated the **advancement of research work and encouraged collaborations with companies in the sector**.

Research is being conducted in collaboration with **Saint-Gobain (SG)** to evaluate the **feasibility of adapting or developing SG mortars for extrusion**. This work emphasizes sustainability, thermal performance, and building renovation. The study includes analyzing the structural systems of 3D-printed cement mortars, the connections between 3D-printed elements, and their compatibility with other components of the construction system.

Efforts are also underway to incorporate **natural materials into 3D printing, particularly using natural soil**. In Portugal, this technique is still rarely applied, and globally, it has been explored only in a limited number of studies. The **3Dmarble** project investigates the use of **marble powder (MP) waste from a local company to create design objects through additive manufacturing**.

Additionally, in partnership with Havelar, multiple research projects have been developed to optimize construction systems for printed concrete and earth-based constructions.

The future

The **future outlook for these technologies is exceptionally promising**, offering numerous benefits and opportunities. These include enhanced **speed and efficiency, greater customization, cost reduction, and improved sustainability**, as the ability to print or assemble structures in situ **significantly reduces waste**.

Moreover, these technologies are particularly well-suited for construction in remote or challenging environments. They also enable rapid responses to disasters and emergencies, providing a **versatile and adaptable approach to modern construction needs**.



Build a Circular Future

[Watch the documentary](#)

The **CDW_LongTerm** project deals with the **use of recycled** aggregates from waste in geosynthetic- reinforced slopes. The **Circular2B** project addresses several circularity topics such as modular **construction** and the **use of nanoparticles from glass waste** to produce **coatings** that, because they absorb less heat, also contribute to the **energy efficiency of buildings**.

Finally, **3D printing**, in addition to **reducing construction time**, also offers the possibility of **introducing waste to replace natural aggregates** and also **partially replacing Portland cement with waste**. Although the three projects have very different characteristics and applications, they have one thing in common: the **use of waste as a resource, a paradigm shift**.

This discussion served as a starting point for a conversation highlighting the crucial role of academia and science in driving the search for more **sustainable solutions and practices**. It emphasized their **importance in supporting and facilitating the implementation of these solutions within the industry**, as well as in educating and training professionals. The goal is to foster a more informed and conscious workforce capable of advancing circularity and sustainability in the Architecture, Engineering, and Construction (AEC) sector.

Vanessa Tavares

Castorina Vieira

Maria Ramalho

The “**Building a Circular Future**” panel was held during the first conference of the **TECH4 Sustainability** initiative, themed “**Greater Circularity**”. The event took place on **July 19, 2024, at Porto Ambiente’s facilities**. Moderated by **Castorina Vieira**, the panel featured **Maria Ramalho, Sustainability Coordinator of Grupo Casais**, and **Vanessa Tavares, Head of Sustainability at the BUILT CoLAB collaborative laboratory**.

The session began with the screening of a documentary showcasing ongoing research **projects at the Civil Engineering Department of the Faculty of Engineering of the University of Porto**. These projects aim to advance **greater circularity in the construction sector**.





The **panelists** also addressed the challenges and **barriers** faced by the construction industry, a sector characterized by unique traits such as the high **prevalence of small and micro-enterprises** and a **reluctance to move away from entrenched practices**. Additionally, the hesitation of some designers and project owners, along with a **lack of confidence in recycled materials**, was identified as a significant obstacle to achieving **greater circularity**—a challenge the AEC sector must work to overcome.



The discussion emphasized the importance of addressing sustainability at the design stage by selecting more sustainable materials and techniques and considering the entire **life cycle of a building**. This includes planning for the maintenance and **end-of-life phases of buildings or infrastructure**. The panel also debated and countered the common perception that sustainable construction necessarily involves higher costs for the end consumer (owner). They stressed the need to evaluate long-term costs rather than focusing solely on immediate expenses related to purchase or construction.

The **availability of financing or incentives to support sustainable practices** and the **role of legislation in promoting the reuse and use of recycled materials** were highlighted as key factors for advancing circularity in the construction sector. Additionally, the potential of digitalization, particularly through **Building Information Modeling (BIM)**, was briefly discussed as a means to **enhance sustainability and improve resource management throughout a building's life cycle**.

Finally, it was highlighted that the **Faculty of Engineering of the University of Porto** recognizes the importance of training all its students in the area of sustainability, as demonstrated in the **Education for Sustainable Development (EDS@FEUP) project**, which aims to effectively develop skills in sustainability in the different study cycles taught at the institution.



TRIFoodFoot

Belmira Neto

Explore the project

The food production chain is a **major contributor to climate change**, accounting for approximately **30% of global greenhouse gas (GHG) emissions**. These emissions, which have a detrimental impact on the planet's climate, stem from various activities associated with the food chain. These include the **combustion of fossil fuels, the production and use of fertilizers and pesticides, enteric fermentation in ruminant livestock, and land-use changes**, such as deforestation.

This challenge inspired the development of a project led by the Faculty of Engineering of the University of Porto (FEUP). The project aims to **estimate the carbon footprint of meals served by the Trivalor Group**, a company that produces approximately 70 million meals annually. To achieve this, a **database of around 400 foods used by the company** was created, enabling the calculation of the carbon footprint for the different meals it provides.

As part of this project, **Belmira Neto (FEUP)**, in collaboration with the **Social Action Services of the University of Porto (SASUP)**, launched an awareness campaign targeting the student community at the Faculty of Engineering.

The campaign **encourages students to make more responsible meal choices by providing information about the carbon footprint of their meals**.

Through a multidisciplinary team, the project seeks to educate individuals about their **personal responsibility in meal selection, empowering them to contribute to a more sustainable food system**.

Globally, the inclusion of **carbon footprint information in food services** remains in its early stages. According to Belmira Neto, **“only a few studies specifically analyze the carbon footprints of food menus in certain educational sectors with the aim of informing the end consumer”**.

Studies of broader scope, such as those by **Carbon Trust UK**, indicate an **increasing number of campaigns focused on communicating the GHG emissions of products**. Notably, two-thirds of consumers view these campaigns as a positive initiative. However, the **regular provision of carbon footprint data for individual dishes is still uncommon**.

While consumers are becoming more aware of **environmental issues, the availability of information necessary for making informed decisions remains limited**. To address this gap, awareness efforts must involve health professionals who can look beyond the **nutritional aspects of menus**. They should advocate for the **use of tools by catering companies** to integrate sustainability considerations into their food services, thereby facilitating informed, sustainable choices for consumers.

NanoCatRed

Salomé Gonçalves

Explore the project

The presence of inorganic contaminants in groundwater and surface waters, at concentrations exceeding the **expected baseline values for these environments**, poses significant risks to public health. The use of such water for human consumption creates a **major health hazard, highlighting the need for effective water treatment processes to remediate the contamination**. However, conventional water treatment methods are often inadequate in removing these types of pollutants.

Catalytic hydrogenation presents a promising alternative technology for removing oxygen-containing anionic compounds (oxyanions) from water, without generating concentrated secondary effluents. Despite its potential, the activity, selectivity, and stability of this technology in water treatment applications still require substantial development. **In the future, catalytic hydrogenation is expected to offer substantial financial and safety benefits over conventional methods**, though there are risks associated with the introduction of new technologies into established markets.

A team of researchers from LSRE-LCM (Laboratory of Separation and Reaction Processes - Catalysis and Materials Laboratory) at the Faculty of Engineering of the University of Porto (FEUP) is developing a system that includes the **creation of nanostructured catalysts** aimed at significantly improving the performance of catalysts in hydrogenation reactions in water.

According to **Salomé Gonçalves, the lead researcher of this group**, the combination of synthesizing innovative metal nanoparticles (MNPs) with high levels of activity, alongside the preparation of nanostructured supports, will enhance the catalytic activity of the metal phases.

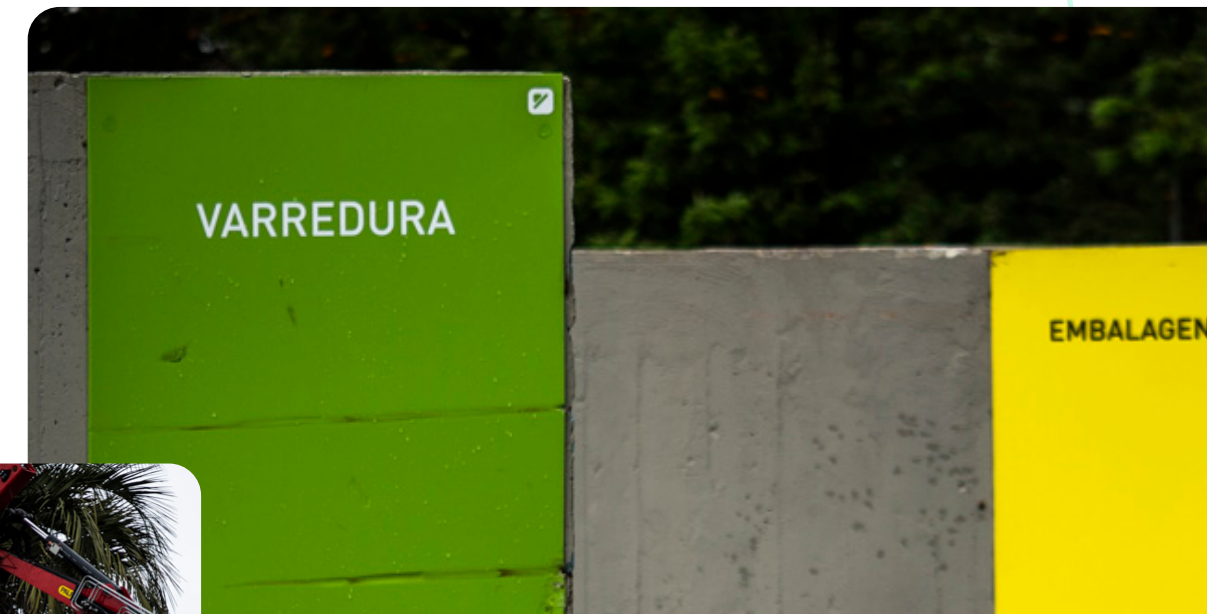
The preparation of these nanostructured supports will leverage recent advances in methods for modifying the textural properties and surface chemistry of carbon nanomaterials and metal oxides. This will help boost the activity of the supported metal phases. The team will then **treat real waters using these catalysts in long-term reactions, ensuring the potential practical application of this technology in real-world settings**.

Porto Ambiente

[Daniel Freitas](#)[Explore the project](#)

Porto Ambiente, the Municipal Environmental Company of Porto, was established by the Porto City Council (CMP) and has benefited from the active collaboration of the Faculty of Engineering of the University of Porto (FEUP), becoming a prime example of the successful partnership between academia and the city. The creation of Porto Ambiente followed a detailed study, initiated nearly a decade ago, which focused on evaluating and optimizing waste collection and urban cleaning processes—key components for ensuring the sustainability of the city of Porto.

The process began with an **initial study** that assessed various aspects of the business, including human resources, equipment, collection circuits, and existing performance monitoring indicators. A **second study** was then conducted, which, based on the data gathered, proposed efficient management scenarios and models for the Porto City Council (CMP) to follow. These models aimed to **improve services provided to the community while meeting demanding national and European targets for sustainability and municipal efficiency**. The data gathered led CMP to realize that in order to implement the proposed changes, it would need to establish a dedicated business unit focused on achieving these objectives.



This led to the **proposal for the creation of Porto Ambiente**, a municipal company with a clear mission: **to sustainably manage urban waste collection and keep the city of Porto clean**. The company has several objectives, including **transforming waste into new resources, adopting greater circularity**, and increasing recycling rates for all recyclable materials. **With a commitment to a zero-landfill policy**, Porto Ambiente plays a key role within LIPOR, ensuring the continuity of material life cycles.

Since its establishment and the start of operations in 2017, Porto Ambiente has achieved significant successes. The **city of Porto** has experienced an **impressive transformation in waste collection**, driven by **increasing recycling rates**, supported by better infrastructure and enhanced resource optimization. More recently, **urban cleaning**, which had already seen improvements, has undergone a further transformation. This has been made possible through its internalization within the company, creating new opportunities for progress—such as the **greater electrification of the new fleet of street sweepers serving the city**.



It is no surprise that **Porto Ambiente** has received recognition for **excellence from the sector's regulator, ERSAR**. These rigorous assessments, based on criteria such as management quality, operational success, and commitment to sustainability, have awarded Porto Ambiente the title of **best company in its field in Portugal on two occasions**. One of the major advantages it has achieved for its citizens is **economic efficiency**, which enables it to offer affordable rates to the public while maintaining the **delivery of high-quality services**.

Looking to the future, the challenges persist. Porto Ambiente remains focused on developing **innovative solutions** that further engage the population in **waste separation and recovery processes**. Investing in new technologies will be essential to ensure that waste is not merely a cost, but a valuable resource that can be transformed and reused. With initiatives like Porto Ambiente, the city is better equipped to **tackle the environmental and urban challenges of the future**, ensuring a **more sustainable, circular, and resilient city**.

Right Dose, Wrap and Organic Project

Daniel Freitas

Food circularity in Porto: initiatives against waste and in favor of sustainability



The city of Porto has implemented a set of innovative projects that aim to promote greater circularity and sustainability of the food system.

Right Dose

Efficiency in the food service sector and sustainable and healthy food

Dose Certa, developed by **Porto Ambiente** and **LIPOR** in collaboration with the **Portuguese Nutrition Association**, was designed for catering establishments, including canteens, restaurants, hotels, and similar venues. Through an integrated approach, the program not only evaluates the current practices of these establishments but also **suggests improvements aimed at reducing food waste and adopting more sustainable menus**. By using seasonal and local products, and optimizing both the quantity and nutritional value of meals, **Dose Certa promotes more conscious eating with a lower environmental impact**. This program has already been implemented in several food establishments in Porto, including the **canteens of the Social Welfare Services of the University of Porto**.

This initiative has led to a significant reduction in food waste in Porto, with 60 tons of food being saved since its inception. Dose Certa underscores the need for **greater circularity in the food service sector**, targeting waste at its source and providing **solutions that enhance process efficiency while reducing operating costs for establishments**.

Explore the project



Wrap it up

Simple, effective and sustainable

The **Embrulha Project**, launched in Porto in 2016, provides a simple and effective solution to combat food waste: restaurant customers can take home leftovers from their meals in biodegradable packaging.

This initiative, developed in partnership with LIPOR, directly reduces the waste generated in restaurants while promoting a culture of using and reusing food that would otherwise be discarded. Through this small action, Porto has been raising awareness among both customers and establishments about the importance of adopting more sustainable practices in daily consumption.

Organic

Transforming waste into valuable resources

Launched in 2021, the **Organic Project** has become a key element in **managing bio-waste in the city of Porto**. The project includes **door-to-door collection** in select areas of the city and the **installation of collection containers for bio-waste produced at home**, aiming to engage the population in separating organic waste.

The collected waste is then sent to **LIPOR's Organic Recovery Center**, where it is transformed into **Nutrimais compost**. This compost, which serves as a **replacement for synthetic fertilizers**, is used in various **agricultural applications**, including organic farming. This process **closes the life cycle of materials** and fosters a more circular and sustainable city model.



ApR

[Elza Ferraz](#)[Explore the project](#)

Water for reuse in Porto: innovation and sustainability in the good management of water resources

Water is an essential resource for life, yet its availability is limited. Recognizing this challenge and the impact of climate change, **Porto has invested significantly in technological innovation to ensure the efficient and sustainable management of its water resources.** As part of this effort, the city has taken innovative steps that reflect its commitment to the circular economy.

A prime example of this innovation is the **ApR (Water for Reuse) Project**, launched in September 2023 by the municipal company **Águas e Energia do Porto**, positioning Porto at the forefront of water reuse in urban environments. Through this project, the city is able to **transform wastewater, treated at its Wastewater Treatment Plants (WWTP), into a high-quality, odorless, and colorless reusable resource, ready for use in various city operations.**

The production process for this water utilizes advanced technology, such as biological reactors with filtration membranes, enabling the **production of up to 1,000 m³ of reusable water per day**. This water is already being used in various urban operations, including **street cleaning, vehicle washing, and waste container sanitation**, thus replacing the use of drinking water. To date, the **project at the Freixo WWTP has saved more than 1.2 million liters of drinking water, demonstrating the positive impact of this pioneering initiative in northern Portugal.**

In addition to its immediate benefits, the project is notable for its flexibility and scalability. The reusable water production system is designed in a modular fashion, allowing for easy expansion if demand for reused water increases in the future. **This adaptability ensures that the city of Porto will be well-equipped to tackle challenges related to water scarcity and continue advancing toward sustainability.**

Water reuse is a central component of Porto's strategy to mitigate climate change. **By reusing treated water instead of relying on new sources, the city not only reduces pressure on its water resources but also lowers emissions associated with the treatment and transportation of drinking water.** This commitment to the circular economy reflects an environmentally conscious vision while directly contributing to climate resilience and carbon neutrality.

Through this initiative, Porto demonstrates how technological innovation can serve as a powerful ally in building a more sustainable future. By transforming water management into an opportunity for resource reuse, the city sets itself as a leading example, promoting a circular model that enhances the quality of life for its residents while safeguarding its natural resources for future generations.





Circularity in action: The City and the Waste

What happened at
the conference

Joana Maia Dias

Daniel Freitas

Luís Assunção

At the **conference on circularity in the city of Porto**, a panel moderated by **Daniel Freitas** brought together two key speakers on the topic: **Professor Joana Maia Dias** from the Faculty of Engineering of the University of Porto (FEUP) and **Dr. Luís Assunção**, Board Member of EMAP - Porto Ambiente.

The conversation focused on the challenges, advances, and achievements in the field of waste management, exploring the collaboration between Academia and the city, in a journey that began about a decade ago and culminated in the creation of **Porto Ambiente**.

The dialogue began with a **reflection on the past**. Joana Maia Dias highlighted the essential role played by **FEUP in supporting the characterisation of Porto's waste management system**, which preceded the creation of Porto Ambiente. This work was crucial in informing the **decision the Porto City Council had to make on the matter**. The academic world, with its deep and systematic technical knowledge, provided the **foundational information for the implementation of a more efficient waste management system**. Detailed studies on collection routes, human and technological resources were fundamental in **shaping the strategy that would lead to the creation of Porto Ambiente**, a local municipal company that, since 2017, has been leading the transformation of waste collection and management in Porto.

Luís Assunção outlined the evolution of **Porto Ambiente**, from its creation to the present day, highlighting **key challenges and milestones**. These included the company's effective establishment, the initiation of **selective and undifferentiated waste collection**, which significantly boosted recycling rates, and the growing availability of waste separation solutions for the population. He also emphasized investments in a new fleet of more sustainable collection vehicles, the **implementation of the Organic Project**, and, more recently, the internalization of urban cleaning





along with the increased electrification of the fleet of sweepers. These are just some of the pivotal moments that contributed to the company's success, which, as Luís Assunção noted, is grounded in its continuous ability to innovate and adapt. This has **allowed Porto to achieve high levels of sustainability and efficiency in the waste sector.** He also mentioned that receiving **Excellence and Quality awards from ERSAR** is the realization of a dream, but emphasized that the journey toward a more circular city is both demanding and ongoing.

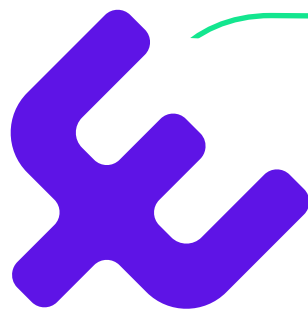


Looking ahead, **both speakers emphasized the importance of continued innovation.** Joana Maia Dias highlighted that the **academy is developing technological solutions to foster greater circularity in waste and materials management.** She emphasized **FEUP's commitment to giving new life to waste**, continuously advancing research in this field. Projects focused on the **development of more sustainable materials** are among the key areas where FEUP is actively involved.

Meanwhile, **Luís Assunção shared Porto Ambiente's vision** for the future, with a clear goal: **to make the waste management system even more accessible and intuitive.** He aims to encourage residents to separate waste in the simplest and most convenient way possible, seamlessly integrating it into daily life without any barriers.

The conversation ended with a message of optimism, highlighting that continued **collaboration between Academia and the city will be essential to face future challenges.** With a **carbon neutrality horizon set for Porto by 2030**, both speakers highlighted that, through innovation and active community participation, **Porto is on the right track to becoming an example of a circular, resilient and sustainable city.**





Greater Circularity



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