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Circular economy planning in higher education institutions: Between policy ambitions and regulatory constraints

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Circular practices have the potential to support urban sustainability transitions and Higher Education Institutions have emerged as strategic actors because of their operational scale, knowledge production, and interaction with urban systems. This study explores the Circular Economy Plan, developed by the Lisbon School of Economics and Management, University of Lisbon, as an institutional initiative embedded in a broader urban circular transition agenda. A multi-method approach combines document and policy analysis, a review of European and Portuguese legislation, semi-structured interviews with staff, and on-site observation of campus operations. The findings show that planning the implementation of circular initiatives in Higher Education Institutions is strongly influenced by regulatory constraints, market conditions, organizational practices, and behavioral dynamics. The plan responds to these conditions via incremental adaptations to existing institutional structures. Applying a multi-level perspective, the study shows that these institutions operate as constrained boundary organizations, mediating between policy frameworks, institutional practices, and urban systems by engaging with supplier, municipal infrastructure and stakeholders. The study contributes to understanding how circular economy strategies are prepared for implementation in Higher Education Institutions and how institutional practices connect with urban systems under multi-level governance constraints.

Keywords: circular economy, higher education institutions, urban circular transitions, multi-level governance, Lisbon

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Introduction

Urban areas are responsible for significant environmental impacts, consuming over 75 % of the planet's natural resources and contributing to 70 % of greenhouse gas emissions (Perrotti et al., 2021). These pressures, intensified by population growth and consumption patterns, increase waste production and the demand for natural resources (Burgalassi & Matsumoto, 2024).

In response, urban policy and planning have developed frameworks to integrate resilience strategies and promote a transition to a circular economy (CE) model, with solutions for reuse, recycling, extending product life cycles, and reducing global environmental impacts in urban areas, where material and energy flows are highly concentrated (Feleki et al., 2025; Williams, 2023).

At the European level, this transition has been operationalized by policy instruments such as the Circular Economy Action Plan (CEAP) and the European Green Deal to improve resource efficiency, reduce greenhouse gas emissions by 2050, and promote sustainable growth (European Commission, n.d.). Translating these policy frameworks into practice, however, requires accounting for the local institutional and territorial conditions where they are implemented. The success of CE implementation depends on how local actors interpret and operationalize wider policy frameworks according to the specific economic, governance, and infrastructural dynamics of their urban contexts (Bahers et al., 2019; Carreira et al., 2024).

In this context, Higher Education Institutions (HEIs) can contribute to knowledge production, stakeholder engagement, and the institutional application of CE principles (Mendoza et al., 2019; Serrano-Bedia & Pérez-Pérez, 2022). This role extends beyond research and policy advice. University campuses function as microcosms of urban systems, managing material flows, procurement systems, waste management, and building operations that reflect urban challenges (Vergani, 2024). This operational capacity creates opportunities for HEIs to serve as experimental environments where circular strategies can be tested, adapted, and refined before implementation (Mendoza et al., 2019).

Despite this potential, CE commitments in HEIs lack systematic implementation frameworks. The literature has primarily focused on curriculum development and research contributions to CE, with limited empirical attention to how institutions operationalize CE principles across their domains of operation (Mendoza et al., 2019; Štrukelj et al., 2023). Implementing CE principles at the institutional level involves negotiating policy ambitions with regulatory requirements, organizational capacities, market conditions, and everyday operational practices (Campbell-Johnston et al., 2019). Although these factors are acknowledged in the literature, there is limited empirical understanding of how they interact during the practical implementation of circular strategies in HEIs.

Lisbon School of Economics and Management (ISEG), a school of the University of Lisbon, recently initiated the development of a Circular Economy Action Plan, approved in 2025, as an institutional response to European and national policy developments. This case provides an opportunity to examine how a public HEI operating in an urban environment translates CE policy ambitions into operational practices during the transition from plan development to early implementation, offering empirical insights into the institutional conditions, constraints, and adaptation processes involved in operationalizing circularity in a real-world context.

This study employs an instrumental case study approach (Stake, 1995) to examine the development of ISEG's Circular Economy Plan, including how the institutional diagnosis informed actions across operational domains, how its implementation is expected to be

shaped, and which institutional, regulatory, and behavioral factors may enable or constrain its implementation. Using a multi-level analytical framework, the research addresses the following questions: (i) how can HEIs facilitate interactions between policy pressures, regulatory constraints, and institutional operational realities when preparing to implement a CE plan; (ii) what tensions emerge between CE policy ambitions and regulatory constraints across different operational domains during this process; and (iii) how are institutional CE initiatives perceived to depend on external urban systems during this process. By exploring these questions based on the ISEG case, this study contributes to understanding how CE strategies are operationalized in HEIs, and how institutional actors perceive their practices as connected to urban systems under multi-level governance constraints.

Literature review

Sustainable cities and the challenges of circular urban transitions

The concept of sustainable cities has evolved from focusing on environmental management (Valencia-Arias et al., 2025) to a more integrated framework that addresses social inclusion, economic development, and environmental resilience (Almulhim et al., 2024). This wider understanding is reflected in the 2030 Agenda, particularly SDG 11, which promotes a comprehensive approach including housing, mobility, resource efficiency, climate adaptation, and participatory governance (United Nations General Assembly, 2015).

However, the expansion of urban sustainability agendas creates new implementation challenges. As sustainability goals become more interconnected, cities start to coordinate actions across multiple policy domains, stakeholder groups, and governance scales, making implementation more complex (Fratini et al., 2019). This creates tension between the ambition of integrated sustainability strategies and the fragmentation of governance arrangements. This tension becomes more evident when cities are understood as complex socio-technical systems, where sustainability transitions depend on the interaction between infrastructures, institutions, governance arrangements, and local actors (Fratini et al., 2019; Calisto Friant et al., 2024). In this context, CE has been proposed by academics, public institutions, and private organisations as a response to multifaceted socio-ecological crises (Calisto Friant et al., 2024). Unlike the traditional linear model of take-make-dispose, CE integrates resource efficiency, economic value creation, and waste reduction into regenerative resource flows (Ghisellini et al., 2016; Remøy et al., 2019). This approach is relevant in urban areas, where large concentrations of people, infrastructure, and economic activity generate substantial material and energy flows (Williams, 2023; Paiho et al., 2021).

The adoption of CE principles has its own tensions. Although many cities have incorporated circularity into their sustainability agendas (Sonnier & Grit, 2022), implementation frequently requires changes to procurement systems, supplier relationships, organizational routines, infrastructure, and governance arrangements. Consequently, the challenge is whether institutions have the capacity to translate circular ambitions into everyday operational practices.

This challenge is particularly relevant for public institutions such as HEIs that manage buildings, procurement systems, resource consumption, waste flows, and large user communities, making them important actors in urban systems. They also face many of the same institutional and organizational constraints that affect sustainability transitions. Therefore, examining how HEIs operationalize CE principles provides insights about the opportunities and limitations associated with implementing circular strategies in complex institutional environments.

Policy instruments for circular cities and urban operationalization

The implementation of CE principles is supported by policy and regulatory frameworks that operate across multiple governance levels. At the European level, the Waste Framework Directive (Directive 2008/98/EC) and the Public Procurement Directive (Directive 2014/24/EU) provide a regulatory foundation for promoting resource efficiency, reducing waste generation, and enabling sustainable procurement practices by public institutions (European Parliament & Council, 2008; European Parliament & Council, 2014). These instruments are framed by the EU Circular Economy Action Plan, which sets the EU agenda for the circular transition (European Commission, 2020).

Public procurement is a policy instrument for promoting circular practices in cities, as public-sector organizations influence markets through their purchasing decisions and operational requirements (Alhola et al., 2019). Beyond these regulatory directives, policy instruments have been developed to accelerate CE implementation. Circular Public Procurement and the EU Taxonomy provide practical support for incorporating environmental criteria into organizational decision-making and for assessing the environmental sustainability of economic activities and investments (European Commission, 2017; Spada et al., 2025). In Portugal, these objectives are set out in the national strategy, the Portuguese Action Plan for the Circular Economy (PAEC), which promotes resource efficiency and reduced dependence on raw material extraction (Silva et al., 2020; European Environment Agency, 2024; Presidency of the Council of Ministers, 2026).

Portugal has also strengthened circular procurement through the National Strategy for Ecological Public Procurement 2030 (ECO360), positioning procurement as an important instrument to encourage sustainable production and consumption patterns (Presidency of the Council of Ministers, 2023). However, implementation remains influenced by institutional and regulatory conditions. The Portuguese Public Contracts Code (CCP), approved by Decree-Law No. 18/2008, requires contracts to be awarded to the most economically advantageous tender, determined by a quality-price ratio or by a single factor such as price (Government of Portugal, 2008). In practice, price continues to carry the most significant weight in the evaluation, influencing how sustainability and circularity criteria are incorporated into public-sector operations, including those of HEIs.

At the national level, the Portuguese Directorate-General for Territory (DGT) launched the National Circular Cities Initiative (InC2) in 2019 to support cities' transition to a circular economy. The initiative promotes collaboration, technical support, and knowledge exchange (Direção-Geral do Território, n.d.). This approach aligns with the National Spatial Planning Policy Programme (PNPOT), which recognizes CE as a strategic principle for territorial development. In particular, measure 3.11, 'Organizing the Territory for the Circular Economy,' calls for the creation of a national network of circular cities and the integration of circularity into spatial planning and governance systems (Direção-Geral do Território, 2020). At the local level, Lisbon participated, through Lisboa E-Nova, in the URBACT network Let's Go Circular! (2023–2025), which supported local action planning and stakeholder engagement for circular transition (URBACT, n.d.).

Implementing CE principles in public organizations requires balancing policy ambitions with institutional and regulatory constraints (Alhola et al., 2019). Public institutions, including HEIs, fall in the scope of ECO.AP 2030, Portugal's programme for resource efficiency and decarbonisation in public administration, and of the national waste legislation, which establish requirements for energy, water and materials efficiency and for waste management (Presidency of the Council of Ministers, 2020, 2024; Government of Portugal, 2020). Given their operational scale and organizational complexity, HEIs are settings where policy objectives can be put into practice in urban contexts.

Pathways of CE implementation in HEIs

HEIs provide a strategic platform for implementing CE principles through teaching, research, and campus operations (Mendoza et al., 2019). Campus operations are important since universities function similarly to small cities, managing complex infrastructures, diverse populations, and resource consumption (Alshuwaikhat & Abubakar, 2008). HEIs can also contribute to sustainability transitions with knowledge production and operational practices, and interactions with surrounding urban systems (De Medici et al., 2018).

Existing examples show that universities adopt different approaches to CE implementation. The Circular Economy Initiative at KTH Royal Institute of Technology (Sweden) promotes CE through research activities and the integration of circular concepts into academic programs (KTH Royal Institute of Technology, n.d.). The initiative is centralized in knowledge production and capacity building. This reflects a tendency identified by Serrano-Bedia & Perez-Perez (2022), in which CE initiatives in HEIs are frequently associated with teaching and research activities and not necessarily addressing the operational dimensions of circularity on campus.

Other institutions blend education, research, and practical experimentation. Laurea University of Applied Sciences (Finland), for example, uses a Circular Economy Living Lab to test and develop circular solutions through collaboration between students, researchers, and external stakeholders (Laurea University of Applied Sciences, n.d.). This approach creates opportunities for experimentation in real-world scenarios and strengthens connections with regional actors.

Delft University of Technology (the Netherlands) adopts a territorial perspective, exploring circularity at regional scales beyond campus operations. It examines how industries, infrastructures, and governance systems interact to support circular development (Delft University of Technology, n.d.). This perspective recognizes that circularity depends on interactions beyond the campus itself, yet progress depends on coordination among multiple actors and governance arrangements, increasing the complexity of implementation. Maastricht University (the Netherlands) adopted a more operational approach through its Circular Campus 2035 strategy, seeking to integrate circular principles into procurement, waste management, infrastructure, and resource use, while also linking campus operations with education and research activities (Maastricht University, n.d.). This approach illustrates the coordination required to connect multiple operational domains.

These examples demonstrate that HEIs engage with CE objectives through different pathways, ranging from knowledge production and experimentation to operational integration of circular principles into campus management. This diversity reflects the multiple functions that HEIs can have in sustainability transitions. Nevertheless, how institutional and regulatory conditions influence the adoption of different CE approaches in HEIs remains unclear. Understanding these dynamics requires frameworks capable of examining how circular initiatives interact with institutional constraints and governance processes across multiple organizational and territorial levels.

Analytical framework: A multi-level perspective

To examine how ISEG's Circular Economy Plan develops under institutional constraints and interacts with urban systems, this study employs the Multi-Level Perspective (MLP) on socio-technical transitions (Geels, 2002, 2011). The MLP provides a structure for understanding how innovations interact with institutional arrangements and societal developments. Recent studies have extended this perspective to HEIs, recognizing their potential to support sustainability transitions through institutional innovation and stakeholder interactions (Radinger-Peer et al., 2021).

The MLP distinguishes three analytical levels: landscape, regime and niche. The landscape represents the broader political, economic, cultural, and environmental context that shapes long-term developments; the regime comprises the dominant institutions, rules, practices, and infrastructures that stabilize existing systems; niches provide protected spaces where innovations can emerge, mature, and challenge established arrangements (Geels, 2002, 2011). Socio-technical transitions result from interactions across these analytical levels (Geels, 2002, 2011).

In the context of HEIs, campus sustainability initiatives, innovative procurement practices, and CE plans can be interpreted as niche-level experiments that seek to influence established institutional routines. The MLP enables the examination of local innovations in relation to institutional structures and policy environments, a perspective increasingly applied to sustainability transitions in higher education (Geels, 2002, 2011; Radinger-Peer et al., 2021).

This study applies the MLP to examine how the ISEG Circular Economy Plan, a niche-level innovation, develops under the constraints of Portuguese regulations and administrative structures, and the infrastructure and policies of the city of Lisbon, while responding to landscape-level pressures from European CE policy. This analysis addresses the challenges of developing circular strategies under a restrictive regulatory structure and explores how institutional actors respond to these challenges.

Figure 1 presents the analytical framework used to position the ISEG Circular Economy Plan in a multi-level circular governance system. The figure illustrates how the plan operates as a niche-level initiative shaped by institutional constraints at the regime level and policy pressures at the landscape level. Boundary organizations operate at the interface between different social systems, such as science, policy, and practice, facilitating knowledge exchange and coordination across organizational and governance domains (Guston, 2001; Gustafsson & Lidskog, 2018). From this perspective, HEIs can be analyzed as boundary organizations when they perform such mediating roles. Boundary functions refer to the specific activities by which these organisations mediate interactions between stakeholder groups and coordinate across institutional and policy contexts (Guston, 2001; Cash et al., 2003). In this study, ISEG is interpreted as a boundary organization because it connects internal institutional practices with policy frameworks, market logics, municipal infrastructures, supplier networks, and stakeholder interactions (Guston, 2001; Trencher et al., 2014).

Guided by this perspective, the empirical analysis examines interactions across landscape, regime, and niche levels, with particular attention to institutional responses to regulatory constraints and the governance dynamics that influence the operationalization of CE principles across institutional domains.

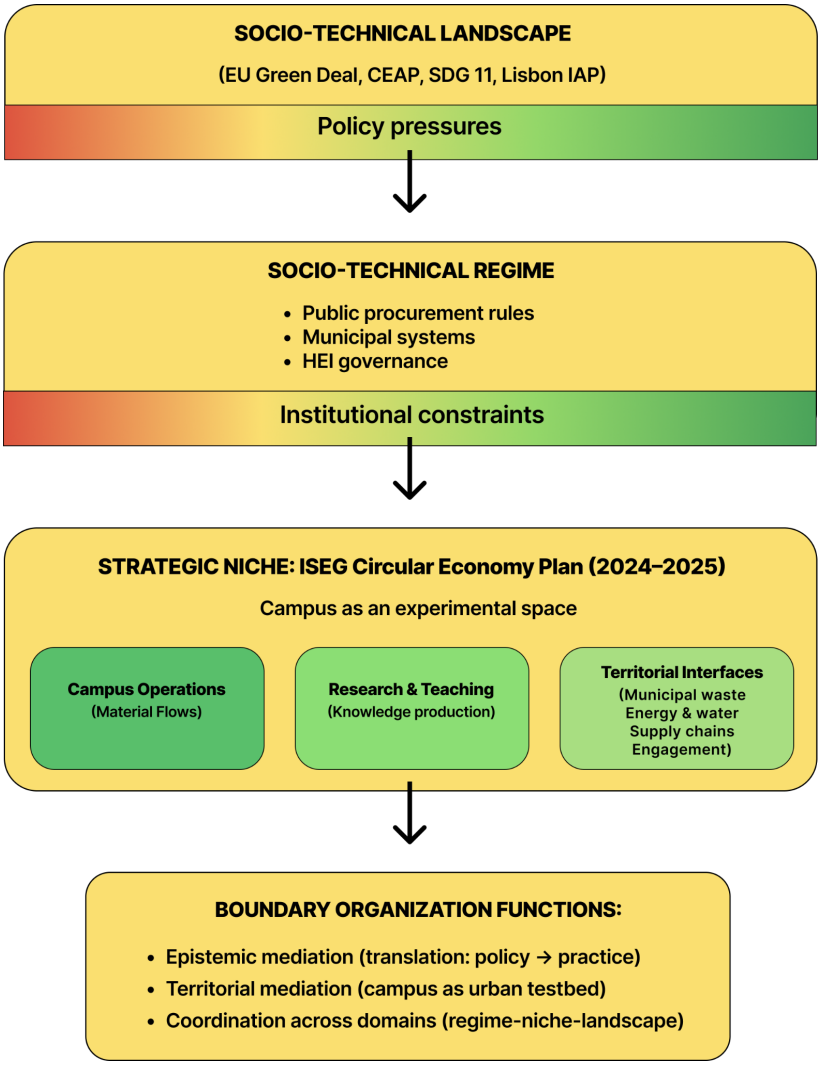


***Figure 1**. Multi-Level Perspective with adaptation for higher education institutions. Source: authors' own elaboration, based on Geels (2002, 2011).*

Methodology

Research design

This study adopts an instrumental case study approach (Stake, 1995) to develop an understanding of how CE principles were interpreted during the diagnosis and development of ISEG's Circular Economy Plan. Following Stake's (1995) view that case selection should prioritize learning opportunities over statistical representativeness, ISEG was selected for institutional access during the early, formative stages of the diagnosis and the plan's development. The ISEG case reinforces the value of case studies that examine how CE initiatives are operationalized into institutional practice.

Given the early stage of implementation, the study does not evaluate long-term outcomes. Instead, it documents the plan's structure, how circularity is translated into proposed actions across operational domains, and the institutional conditions and constraints that influenced its development.

Case study context: ISEG and the Circular Economy Plan

Campus operational characteristics provide the material and organizational context in which CE interventions are developed and implemented (Mendoza et al., 2019). The case study of ISEG, located in the central area of Lisbon, illustrates this context. The campus has five buildings, small green areas and no laboratories or training facilities (ISEG – Lisbon School of Economics & Management, 2023). It has approximately 5,000 students, 290 faculty members, and 69 staff members, excluding outsourced personnel. These characteristics provide the context for examining interactions between campus activities and the urban systems.

From an operational perspective, annual electricity consumption is approximately 1,600,642 kWh, natural gas consumption is 10,851 kWh, and water consumption is 10,762 m^3 (ISEG – Lisbon School of Economics & Management, 2024). The spatial configuration, infrastructure, and resource consumption patterns help clarify which sustainability interventions are needed (Alshuwaikhat & Abubakar, 2008).

From an economic perspective, 17.5 % of the institution's annual budget is allocated to the acquisition of goods and services (Universidade de Lisboa, 2023). This procurement volume constitutes a relevant operational domain for examining the incorporation of CE principles. Public procurement represents a mechanism for advancing circular practices through demand creation and market transformation (Alhola et al., 2019).

In 2021, the institution adopted a Sustainability Strategy 2030, addressing campus operations, community engagement, education, and research (ISEG – Lisbon School of Economics & Management, 2021), without explicitly framing CE practices. This strategy was complemented by a Sustainable Procurement Policy. In 2023, ISEG obtained ISO 14001 certification, a formal environmental management system (ISEG – Lisbon School of Economics & Management, 2023).

Although the Sustainability Strategy 2030 addressed sustainability goals, the need for a more specific operational approach to campus circularity led to the development of the Circular Economy Plan. The plan was structured around five interconnected strategic areas to integrate circularity into campus operations, education, and management practices, reflecting institutional priorities and national and European sustainability policy frameworks. Based on internal diagnostics and aligned with national and European policies, it outlines actions in areas such as procurement, waste management, energy efficiency, water use, and community involvement.

A multi-method approach was adopted to build the institutional diagnosis that informed the plan, combining complementary data sources to achieve a comprehensive understanding of the institutional and policy contexts. The process followed three stages (Figure 2):

i. document, policy, and legislation analysis;

ii. semi-structured interviews with operational departments; and

iii. on-site observation.

The three stages aimed to provide complementary evidence concerning policy and institutional contexts, stakeholder perspectives, and campus operations.

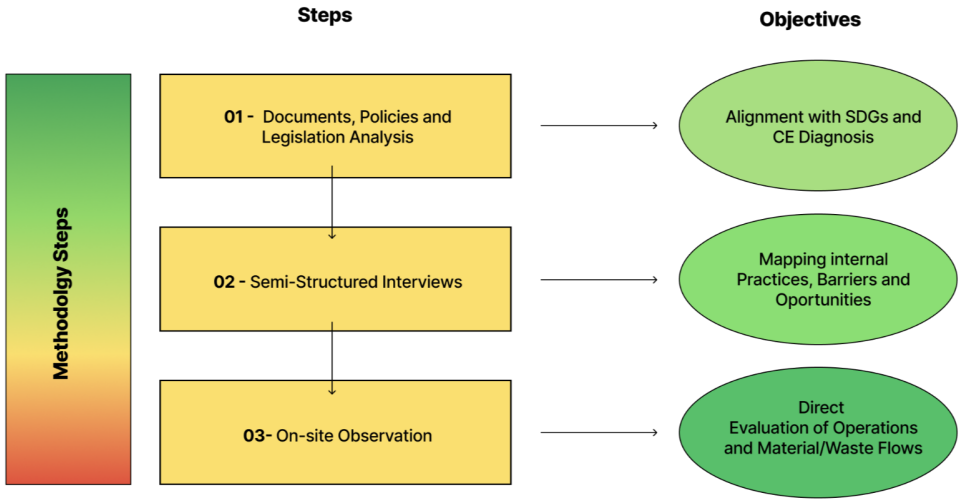


Figure 2. *Methodological steps and objectives in the development of the ISEG Circular Economy Plan. Source: author's own elaboration.*

Document, policy, and legislation analysis

As part of the development of the plan, a structured document analysis was conducted to identify how CE principles were incorporated into institutional practices and aligned with European and Portuguese policy frameworks. The analysis included three categories of materials:

1. European policy instruments and legislation relevant to CE implementation in public institutions, particularly in areas such as waste, procurement, and resource efficiency;

2. Portuguese policy and legislative frameworks, including national CE strategies, public procurement regulation, waste legislation, and public-sector decarbonization programs.

3. Institutional documents, including sustainability strategies, sustainability reports, procurement policies, progress reports and internal resource and waste management guidelines;

Documents were included if they established legal obligations for public institutions, provided strategic guidance linked to CE objectives, or defined operational requirements relevant to campus management.

The objective was to map the institutional and regulatory context in which the plan was developed and to identify policy-aligned domains that could inform its operational priorities. Institutional documents and policy frameworks were cross-referenced with CE principles and proposed actions using the implementation domains proposed by Mendoza et al. (2019).

Semi-structured interviews

Semi-structured interviews were conducted to understand how CE processes are implemented in practice, how decisions are operationalized, and which constraints or enabling factors are perceived by staff involved in daily operations. This method allows the collection

of rich insights and gives participants the opportunity to explore topics they consider significant in a flexible interview structure that adapts to their responses (Longhurst, 2009).

Qualitative purposive sampling guided participant selection, based on their relevance to the research objectives and involvement in the domains under investigation (Ahmad & Wilkins, 2025). The sample included seven representatives from operational units directly involved in procurement, campus operations, waste management, community engagement, strategic planning, and governance and sustainability coordination. The seven participants were not involved in developing the plan or this study. The interview process was carried out by three researchers from other universities. The sample provided comprehensive coverage of the institutional functions most directly associated with the development and implementation of the plan. With participants' consent, interviews were audio-recorded to ensure accuracy. Notes were also taken to support data organization and interpretation.

On-site observation

A technical visit was conducted on the ISEG campus to obtain direct information about daily functioning and operational conditions. The visit included access to all campus facilities and enabled the assessment of infrastructure conditions, analysis of material and waste flows, and logistics on campus. The visit also facilitated the recognition of existing practices that were not formally documented and could contribute to campus circularity. A concise report including photographs and summaries of each facility was prepared. The observations complemented documentary and interview evidence by providing direct information about campus operations.

Data analysis

The qualitative data analysis followed a deductive analytical strategy based on categories derived from the literature on CE implementation in HEIs. The five implementation domains of procurement, campus operations, waste management, community engagement, and monitoring and evaluation were informed by the operational areas used by Mendoza et al. (2019) and adapted to the context of the study. These domains were selected because they also corresponded to the operational functions frequently discussed in the literature (Ogunmakinde, 2024, 2025; Oliveira & Proença, 2025).

The empirical material, including institutional documents, interviews, and on-site observations, was organized according to these five implementation domains. Document analysis identified formal policies, objectives, and institutional commitments. Interviews explored how operational staff perceived and implemented CE-related practices, and direct observations documented how these practices were reflected in everyday campus activities.

The analysis examined three complementary aspects: (i) formal and existing CE practices, including activities not explicitly recognized in institutional documents, acknowledging that everyday practices and community initiatives may contribute to the development of circular campuses (Hobson & O'Byrne, 2024); (ii) barriers and constraints affecting implementation; and (iii) the responses subsequently incorporated into the Circular Economy Plan to address these challenges. This facilitated the comparison of evidence obtained from different data sources and the identification of relationships between institutional objectives and operational practices.

The findings from the five implementation domains were consolidated into an institutional diagnosis that informed the development of the plan. Table 1 links the practices and constraints identified in this diagnosis to the corresponding proposed actions included in the

plan. The Multi-Level Perspective (MLP) framework (Geels, 2002; Geels & Schot, 2007) was then applied to examine how the resulting Circular Economy Plan was embedded across multiple governance levels. This perspective considered the institutional context of ISEG, its interactions with the urban environment of Lisbon, and the influence of national and European regulatory and policy frameworks shaping CE implementation.

The combination of document analysis, interviews with operational staff and on-site observations provided complementary perspectives on institutional practices and operational conditions. Drawing on the understanding that CE implementation in HEIs encompasses formal policies, operational routines, and everyday practices (Hobson & O'Byrne, 2024; Mendoza et al., 2019; Oliveira & Proença, 2025), the use of multiple data sources enabled the comparison of evidence across different institutional perspectives and reduced the reliance on one single source of information.

Research ethics and data protection

Ethical considerations were integrated to the research process. Ethical approval was obtained following institutional guidelines for research involving human subjects. Participation was voluntary and based on informed consent, with participants informed of the study purpose, data use for academic publication, and withdrawal rights. Interview data were anonymized during transcription, and no personal identifiers were retained in the dataset or direct quotations. Audio files, transcripts, and notes were stored under restricted access. The institutional documents used were publicly available or accessed with authorization.

Results

The findings result from the triangulation of document and policy analysis, semi-structured interviews, and on-site observation, organized according to the five implementation domains adapted from Mendoza et al. (2019). For each domain, the analysis combines formal institutional commitments identified through document analysis with operational practices, existing initiatives, and constraints reported during interviews and observed on site. Table 1 summarizes the practices and constraints identified, and the corresponding action included in the plan; the subsections that follow present this evidence in detail, including direct accounts from interview participants.

***Table 1**. Implementation domains of the ISEG Circular Economy Plan*

Implementation domain	***Practices identified***	***Implementation constraints***	***Actions included in the Plan***
Public Procurement	Sustainable Procurement Policy aligned with ECO360 (Presidency of the Council of Ministers, 2023); environmental criteria in supplier selection; product-as-a-service models (e.g., IT leasing).	Limited pool of certified suppliers; procurement procedures strongly influenced by price criteria; absence of systematic mechanism to monitor or verify supplier compliance after contract award.	Gradual integration of circular criteria; preference for certified and refurbished suppliers.
Campus Operations	Water-saving devices, motion sensors, real-time energy/water monitoring; digitalized administrative processes (Fénix, Jira).	Consumption patterns influenced by user behavior; unused furniture and materials; limited bicycle parking capacity; partial coverage of motion-sensors and water-saving devices.	Repair and reuse initiatives; expansion of bicycle infrastructure; renewable energy and water-efficiency improvements.
Waste Management	Compliance with ECO.AP 2030; e-GAR tracking for electronic waste; municipal collection for paper, plastics, glass.	Incorrect source separation; insufficient bin labeling and placement; contamination during external events; absence of systematic quantification of ordinary waste streams.	Waste audits; improved recycling infrastructure with multilingual and color-coded labeling; removal of single undifferentiated bins; small-scale composting systems for gardening waste; awareness campaigns and staff training.
Community engagement	Seminars, conferences, public lectures, and research collaborations involving companies, NGOs, policymakers, and civil society actors.	Uneven CE awareness among staff and stakeholders; persistent consumption habits; limited collaboration with surrounding communities.	More public events, workshops, and educational initiatives on CE topics; expansion of partnerships with companies and NGOs to support circular initiatives.
Monitoring and Evaluation	Data reported in the Sustainability Report, by indicators on energy, water, gas and carbon.	Lack of monitoring indicators for waste generation and recycled materials; limited data on outsourced material flows.	Establish short, medium, and long-term targets; adoption of sustainability assessment; benchmarking frameworks adapted to HEIs.

Public procurement

Document analysis showed that ISEG adopted a Sustainable Procurement Policy aligned with ECO360, incorporating environmental criteria into procurement procedures and supplier selection. Practices include service-based procurement models, such as IT equipment leasing, and the consideration of environmental certifications (ISO 14001 or EMAS). Interviews indicated that procurement activities focus largely on services, including IT, security, cleaning, software licenses, and maintenance contracts, making the application of CE principles more complex than in conventional goods procurement.

Interviews identified important implementation constraints. Participants reported difficulties in ensuring that suppliers adopt sustainability practices across the supply chain and highlighted the limited availability of suppliers capable of meeting environmental requirements. One interviewee noted: *'Ideally, when we acquire a product or service, we should make sure that the companies also have their own sustainable practices, but this doesn't always happen'.*

Interviewees also reported that procurement decisions are strongly influenced by public procurement regulations and cost-based evaluation procedures, limiting the incorporation of additional circular requirements: *'If it was mandatory for everyone, they'd all compete on equal footing [...] since some comply and others don't, those who don't comply are favored'*. Participants indicated that environmental ambitions need to be balanced with legal compliance and market availability, particularly in service contracts where circular solutions are less established. From the ISEG perspective, document analysis identified no systematic mechanism to monitor the number of contracts incorporating sustainability criteria or to assess compliance with environmental requirements after contract award.

These constraints led to the inclusion of additional circular procurement criteria in the Circular Economy Plan, as a way of signaling priorities to the market: *'Even if it's symbolic, it shows we care and could influence others',* concluded one participant.

Campus operations

Initiatives to improve resource efficiency on campus include water-saving devices, motion sensors, digitalized administrative processes, and real-time monitoring systems for energy and water consumption. One participant explained: *'We can see consumption every 15 minutes. If there's a spike, we know immediately and can act'.*

On-site observations documented the long-term storage of unused furniture and materials, and interviewees reported continued paper consumption in some administrative and academic services despite the digital systems. Limited bicycle parking capacity and the dependence of resource efficiency measures on user behavior were also identified. Motion sensors and water-saving devices don't cover the entire campus, and renewable energy sources are not yet implemented. It was observed that there was no active monitoring process of material consumption, such as paper and cleaning products.

The Circular Economy Plan incorporates additional measures, including solar panels, rainwater collection systems, expanded bicycle parking facilities, and electric vehicle charging stations. Initiatives to promote repair and reuse of furniture and equipment were also proposed, despite the problem with repair, as noted: *'It's increasingly difficult to find such services today. [...] those who provide these services either lack time or charge exorbitant prices'*. These limitations informed a more structured framework for consolidating existing operational practices in the Circular Economy Plan.

Waste management

Waste management practices follow national regulations and ECO.AP 2030 guidelines. Specific waste streams, including electronic waste, batteries, and lighting equipment, are tracked with the e-GAR (Electronic Waste Tracking Waybill), and paper, plastics, glass, and general waste are collected by the municipal services. Interviews and observations identified operational challenges. Waste separation was reported as a major constraint, as one participant explained: *'You can't make people throw things in the right bin [...] there's no way to police everyone'.*

Observation documented issues related to bin placement, insufficient labeling, and contamination of waste generated during events involving external participants. Interviews also indicated that some responsibilities were transferred to suppliers, with limited institutional visibility over what happens afterwards: *'When we do this, in reality, we are transferring responsibility [...] the company collects it, and what they do with it is not our concern'.* Document analysis and observations did not identify a systematic mechanism to quantify the generation of ordinary waste or monitor recycling performance across the campus. Participants reported that data on general waste generation are largely based on estimates and that the institution has limited visibility over waste once it enters municipal collection systems. Activities involving external stakeholders were also identified as increasing the complexity of waste management.

To address these gaps, the plan proposes waste audits and better proxies to quantify waste production, improved recycling infrastructure to reduce separation errors, composting systems for gardening waste, and awareness initiatives for users.

Community engagement

Community engagement connects sustainability initiatives with external stakeholders. Existing activities include seminars, conferences, public lectures, and collaborations involving companies, NGOs, policymakers, and civil society organizations.

Interviews revealed different levels of awareness regarding CE practices among members of the university community. One participant observed that *'some staff believe that every 3 years, their computer must be replaced. We must stop that habit [...] by shifting the culture'.* They also emphasized the importance of strengthening relationships with the surrounding community and external stakeholders to support engagement with sustainability initiatives.

Participants associated reusable or refurbished products with lower quality and operational problems. This finding suggests that perceptions of inferior performance may persist over time and influence the acceptance of circular alternatives, creating a stigma around reuse and refurbishment practices.

Despite the availability of sustainability information and engagement activities, participants indicated that awareness does not always translate into behavioral change and recognized that changing established habits remains a significant challenge for the implementation of CE practices.

Monitoring and evaluation

Consumption monitoring is supported by data from systems (E-redes and WaterBeep), and is reported in the Sustainability Report, including consumption indicators of energy, water, gas and carbon emissions. However, interviews and document analysis identified challenges in monitoring waste generation and recycled materials, limiting the ability to assess progress in some areas. This was partly attributed to a mismatch between financial and physical-quantity data: *'We don't have quantities. We only work with financial values — not unit counts'.*

Interviewees also reported that some material flows associated with outsourced services remain limited in terms of monitoring, as operational information is managed by external service providers and is not available for institutional reporting. This applied to certain consumables and operational materials and services.

The following section applies the Multi-Level Perspective (MLP) to interpret these findings and examine common implementation challenges identified in university circular economy initiatives.

Discussion

The findings provide empirical evidence of how CE initiatives in HEIs interact with institutional, regulatory, and societal contexts. The Circular Economy Plan can be interpreted as a niche-level initiative that develops under the influence of regime structures and landscape pressures (Geels, 2002), reinforcing the argument that sustainability transitions emerge from interactions across multiple governance levels instead of isolated technological or organizational interventions (Geels, 2002; Radinger-Peer et al., 2021). CE implementation appears not as a linear process of organizational change, but an adaptive process shaped simultaneously by policy frameworks, institutional capacities, existing operational practices, and relationships with external actors.

At the niche level, the Circular Economy Plan proposes alternative practices that challenge conventional resource management models. Circular procurement criteria, refurbishment strategies, improved waste separation, community engagement initiatives, and enhanced monitoring systems represent institutional innovations intended to promote more circular resource flows. Similar patterns have been identified in other HEIs, where CE initiatives frequently emerge with specific projects and operational programs instead of comprehensive institutional transformation (Sukiennik, 2022). The findings support this interpretation, suggesting that universities often adopt gradual and pragmatic approaches to circularity.

However, the findings indicate that niche innovations remain strongly conditioned by regime-level structures. Procurement provides a clear example. Although the plan promotes environmentally certified suppliers, service-based business models, and refurbished products, implementation remains constrained by procurement regulations, supplier availability, and limited monitoring mechanisms after contract award, reflecting a misalignment within the regulatory regime itself. Similar institutional barriers have been identified in other university contexts. Shahidi Hamedani et al. (2026) also identify funding limitations and ageing infrastructure constraints for CE implementation in Malaysia. This case study demonstrates that regulatory procedures and market conditions can create comparable limitations also in a European institutional setting, suggesting that CE implementation barriers extend beyond financial resources and infrastructure, encompassing governance arrangements and institutional routines.

European initiatives, including the Circular Economy Action Plan, together with Portuguese strategies such as PAEC and ECO.AP 2030, create policy expectations that encourage universities to adopt circular approaches. Nevertheless, the case demonstrates that policy alignment alone does not ensure implementation. Translating policy objectives into operational practice requires adjustments across all five implementation domains. This observation supports previous studies arguing that policy ambition and implementation capacity do not necessarily evolve at the same pace (Alhola et al., 2019; Serrano-Bedia & Perez-Perez, 2022).

The MLP interpretation also provides insights into the role of HEIs as boundary organizations. Findings from the implementation domains illustrate this role in concrete terms. Radinger-Peer et al. (2021) argue that universities can connect different governance levels and facilitate sustainability transitions across institutional and urban systems. The case supports this perspective but also highlights its practical limitations. ISEG interacts with municipal waste services, supplier markets, and urban utility networks, yet these relationships remain dependent on external governance arrangements. The institution can improve waste separation practices and introduce sustainability criteria into procurement processes, but has limited capacity to redesign municipal waste infrastructure, influence energy systems, or expand the supply of environmentally certified products.

The findings related to waste management, campus operations, and monitoring further illustrate these structural dependencies. Existing regulatory frameworks establish reporting obligations for specific waste streams but do not require comprehensive monitoring of ordinary waste generation or material consumption. In addition, the study identified limited institutional visibility over outsourced material flows, including cleaning and maintenance supplies managed by external contractors.

Another important finding concerns the interaction between technical and behavioral dimensions of circularity. Infrastructure improvements alone do not guarantee circular practices. The findings indicate that waste separation, resource efficiency, and community participation remain influenced by everyday user behavior, as shown by Hobson & O'Byrne (2024), who argue that user engagement is essential to successful CE implementation. The case therefore reinforces the argument that sustainability transitions require both technological and social adaptations.

Taken together, these findings suggest that the tensions identified across the implementation process should not necessarily be interpreted as implementation failures. Instead, they represent characteristics of sustainability transitions operating under existing governance structures. The case study indicates that CE implementation in HEIs tends to progress through incremental institutional adjustments that accommodate regulatory requirements, operational realities, and organizational capacities identified during the diagnosis. This observation complements the MLP literature by providing empirical evidence of how niche initiatives evolve in a university context under multi-level governance conditions.

The findings also generate practical implications for HEIs developing Circular Economy Plans. First, institutional diagnosis appears essential for identifying operational opportunities and constraints before defining actions and targets. Second, integrating circular initiatives into existing management structures may facilitate implementation. Third, regulatory, organizational, market, and behavioral factors should be considered from the outset, since they shape implementation possibilities. Finally, the gaps identified in monitoring systems suggest that data collection capacity should be incorporated into the planning stage because effective evaluation depends on information that may not already exist.

Conclusion

Using the case of a HEI, this study demonstrated that CE implementation extends beyond the adoption of technical solutions and depends on the alignment between institutional ambitions, governance structures, and everyday operational practices. The findings indicate that Circular Economy Plans in HEIs tend to emerge as incremental institutional innovations shaped by existing regulatory frameworks, market conditions, and organizational capacities. Interpreted through the Multi-Level Perspective, the study shows how niche-level initiatives are influenced by regime structures and landscape pressures, providing empirical evidence of the challenges associated with translating circular ambitions into operational practice. This contribution should be read as an empirical illustration of these dynamics in a specific institutional and regulatory setting, rather than as a general model for CE implementation for HEIs.

These initiatives also interact with municipal waste services, supplier markets, and utility networks that constitute the city's wider urban systems, although this connection remains transactional and bounded. The institution can adjust its own practices but cannot reshape the external infrastructures on which it depends.

Three limitations should be acknowledged. First, the study is based on a single case and reflects the specific institutional and regulatory context of Portugal. The findings may not transfer directly to HEIs operating under different legal frameworks, although they are likely compatible with other public institutions in Portugal, such as universities or government

agencies, that face similar regulatory requirements for incorporating circular practices. Second, the Circular Economy Plan is at an early stage of implementation, preventing an assessment of long-term outcomes. Third, the analysis drew on seven semi-structured interviews, without incorporating the perspectives of external stakeholders.

Future research could address these limitations with comparative studies across HEIs in different governance contexts and longitudinal analyses examining implementation outcomes over time. Research involving external actors would also help clarify how much of the tension between policy ambition and regulatory constraint is negotiable beyond the institution itself. Finally, further work could test whether existing MLP categories capture variation in the same governance level, which behaved as constraints of a different nature despite both operating at the regime level.

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